

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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Washing Phosphoric Pig Iron for the Open-Hearth and Puddling Processes, at Krupp's Works, Essen.*

BY A. L. HOLLEY, C. E., LL. D.

This process is performed in the Pernot puddling-furnace; it removes from 75 to 80 per cent. of the phosphorus, and practically all the silicon, from crude iron, in from 5 to 8 minutes. It has been in regular use since March, 1877, and has produced over 17,000 tons of washed metal for the open-hearth furnace. During two years, nearly all, and lately, all the open-hearth steel produced in those works has been made from about 5 tons of washed pig and 2 tons of scrap per open-hearth furnace heat. There are 12 open-hearth furnaces, of which four to nine are running, according to the state of orders. A large amount of highly phosphoric iron from France and Belgium has been also washed and then puddled for parties who have taken, or are expected to take, licenses. The washing of pig for puddling, however, is not a practice at Krupp's works, because pure pigs are nearly as cheap as impure ones.

The author and his assistant, Mr. Laureau, spent, during the last month, three days at Krupp's works, examining this process. They copied out of the office books many characteristic analyses and physical tests, some of which are given herewith. They also brought home many samples of pig, cleaned metal, puddle bar and steel, which they saw treated.†

As there are no blast furnaces at Essen, the iron is melted in two Bessemer cupolas with fore-hearths; they melt 12½ lbs. of iron with 1 lb. of coke. The metal is run by a spout from the fore-hearth into an opening at the side of the main door of the washing furnace.

The Washing Furnace.—This is a regenerative gas furnace. It has a Pernot revolving hearth of 12 feet external diameter and 3 feet depth. The four regenerator chambers have 780 cubic feet capacity, which is about the same as the average regenerator capacity of open-hearth steel furnaces of equal tonnage. The lining is 13 inches thick on the sides and 9 inches on the bottom, thus giving a hearth 9 feet 10 inches by 2 feet 3 inches deep. The lining is composed of lumps of highly refractory ores roughly fitted together, the interstices being filled with fine ore, and the whole being glazed at a melting temperature. Large lumps are placed on the sides and smaller lumps on the bottom. When the fine ore has melted and run between the lumps, more fine ore is put on and melted, until the lining becomes monolithic. The hearth is then fettled.

The Fettling.—This averages 20 per cent. on the pig-iron charge, but more is used with irons very high in phosphorus. Iron ore alone has been used; also hammer scale alone; usually iron with a little hammer scale is employed. The charges run out very clean and hot. After each heat the gas is turned off for five minutes while the tap-hole is turned on the high side and redressed. The bottom sides, or lower part of the slopes of the hearth, which have been most eaten out during the process, are then filled with fettling ore wet up with just enough water to make it stick together, so that it can be readily handled and so that it will not blow over into the regenerators. A long-handled, large, shallow spoon is placed across a bar in the charging door. One workman shovels the fettling into the spoon; another throws it out of the spoon against the slope. After each two or three spoonfuls, the hearth is revolved a little, so that the fettling is always conveniently dropped in the same place relatively to the door. This operation occupies 16 to 20 minutes.

The fettling should contain a minimum of silica (6 per cent.) and a maximum (15 per cent.). If the silica exceeds 15 per cent., or if the silicon in the pig exceeds 1 per cent., it is best to add as much lime as there is silica in the ore (a little lime is always useful); if the silica is less than 6 per cent., the fettling will not adhere.

The maximum temperature, which is above high puddling heat, but considerably lower than open-hearth steel heat, is kept up between, as well as during, the operations; this temperature slightly melts the surface of the fettling, and sometimes melts furrows 2 or 3 inches deep in the less re-

fractory parts. During this time the hearth is revolved three or four turns per minute.

The Irons Used.—The charge is from 5 to 7 tons—usually 5 tons. Messrs. Bender & Narjes, who have developed the process, insist that at least 0.30 per cent. of manganese is essential to the most economical result, even if it has to be added in the shape of spiegeleisen. They prefer 1 per cent. manganese. It seems quite certain from analysis that manganese protects carbon from oxidation, and so keeps the bath very hot and fluid until the phosphorus is re-

fractory parts. During this time the hearth is revolved three or four turns per minute.

duced. Carbon should also be as high as possible—at least 2.7 per cent. As little as 2.5 per cent. of carbon has been employed, but 3 per cent. is preferred. Silicon should be as low as possible. If it is higher than 1 per cent., lime must also be added. There is a greater waste of fettling, and the operation is prolonged. The silica

charge from the cupola is from 5 to 7 tons. It begins at once to bubble in the Pernot hearth, from the mechanical action of pouring. As soon as it is all in, the revolutions of the hearth are increased to 11 per minute. Large blotches of slag soon appear, with iron spouting through; but this is no criterion of the state of the bath. Usually

to 6 or 8 inches, and are broken here and there by iron spouting through; the ebullition seems a little more sluggish than at the first stage of the operation, but the bubbles are much larger, and increase more and more in size and number as the operation advances. The spouting iron, toward the last, rises from 6 to 10 inches above the bath, and presents the appearance of a miniature forest of trees. The bubbling is not, however, as lively as that of the pig-and-ore bath, because the temperature is lower. The close of the operation is indi-

stands in a pit about 20 feet from the tap-hole; the other ladle is about 50 feet away. Some slag runs out with the last of the metal; this runs over the ladle into a spout which conducts it to a slag-pit in the floor. When the metal is all out, a section of the furnace-spout is moved laterally, to run the bulk of the slag into a pit. One ladle sits in a car which is raised to the general level by a hydraulic lift and is then drawn to the front of the open-hearth furnace; the ladle is tapped into a spout 12 feet long leading into the furnace door. The other ladle is raised out of its pit by a locomotive crane, which also transports it to the open-hearth furnace. The metal may be held in the ladle 20 minutes without perceptible chilling.

The pig bed for receiving washed iron for puddling begins 20 feet from the furnace tap-hole. The slag that runs out with the metal is partly stopped by a skimmer and partly run off the end of the sow. When the metal is all out, a section of the spout is moved laterally to run the slag into a pit, or the furnace tap-hole may be moved laterally, to run it on the floor.

These arrangements are obviously not so convenient as they could be made in a new plant. The washed iron should also be kept fluid for puddling as well as for the open hearth; in these works it is remelted in a cupola, as the puddling plant is a long way off.

Output of the Refining Furnace.—The operation and the repairing and heating (¾ hour) of the new fettling occupy altogether, on an average, 1¼ hours, so that nine 5 to 7 ton heats may be made per turn. The regular output is 80 to 90 tons per 24 hours, and the regular wages

are based on 80 tons; a large bonus is divided among the workmen on an excess of product. It is obvious that one washing furnace could keep one very large or two medium blast furnaces going.

Waste.—As the impurities of the iron are removed by the oxygen of the ore, there is no waste of iron, except 1½ to 2 per cent. which is mechanically entangled in the slag, and is thus wasted, unless the slag is cleaned. The ore comes out as slag; it is too highly phosphorized for use in the iron manufacture, but is worth about 40 cents per ton to silver and lead smelters.

The Open-Hearth Process.—The open-hearth charge usually consists of 5 to 5½ tons of washed pig and 2 to 2½ tons of scrap, not preheated. With this charge, a half ton of ore is used in the open-hearth furnace; but, with a 7 to 8-ton charge of washed pig, without scrap, one ton of ore would be used. Some 8-ton heats, with 3 tons of scrap, were observed. The time of making a 7-ton open-hearth heat, as observed, averaged seven hours, and the time of repairing the furnace between was about one hour. The increased output by using washed pig in the proportion mentioned, as compared with the old pig and scrap process, is about one ton per furnace per shift. The waste of iron is also considerably decreased by reason of the low silicon. The principal products are tires, axes, plates and forgings.*

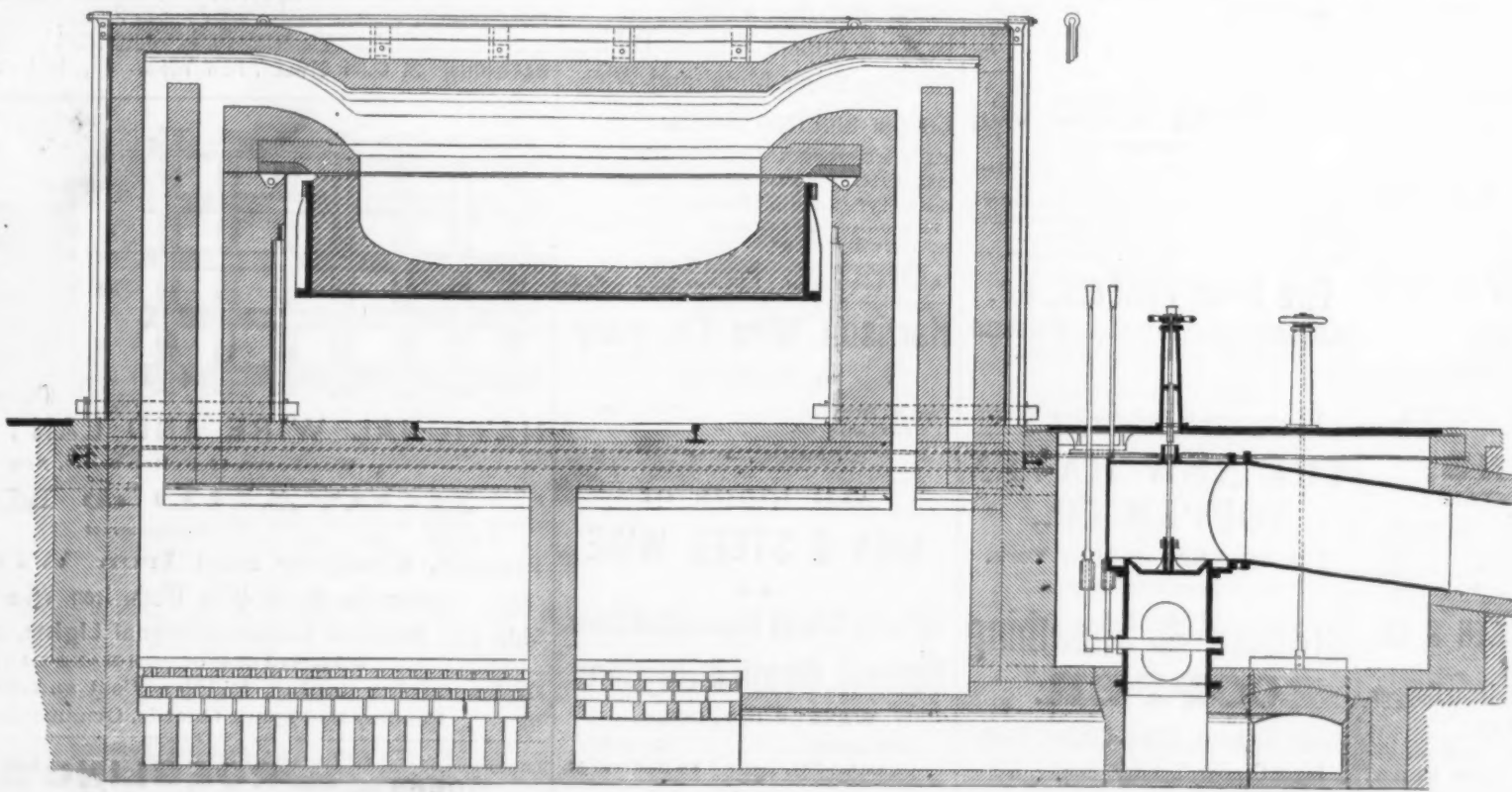
Cost.—At Krupp's works, the washing process costs about as follows per ton of open-hearth steel: Mixture of iron, \$12; cupola melting, 85c.; washing, including fettling, repairs, fuel, labor, &c., \$1.25= say \$14. Bessemer pig, however, costs but about \$15.25, so that only \$1.25 profit is realized. Members can readily apply these figures to different conditions in various parts of the United States. Cupola melting is, of course, unnecessary if blast furnaces are near.

The men employed at the washing furnace are one melter, one helper, and two or three laborers who wheel ore and slag; also pig-bed men if blast furnace metal is not used direct. The steel furnace laborers get the metal from the washer to the steel furnace.

The washing process is without value to the Bessemer manufacture, which depends upon silicon for its converting heat. Repeated experiments in blowing washed metal in a gas-heated converter have been unsuccessful.

Repairs of Washing Furnace.—The hearth is generally, but not always, pulled out Saturday night to repair the lining by means of lumps of refractory ores. The lining is usually kept good by the daily fettling. The roof lasts from six to nine months, excepting the parts around the ports, which last from five to seven weeks. The regenerators must be cleaned every two months.

Experiments at St. Chamond.—The author learned at these works, as well as at Essen, * The author saw, nearly completed, a new ram or stem-post for the iron-clad König Wilhelm; it was a complex forging from open-hearth Fluss-eisen, containing carbon 0.08.



THE PERNOT WASHING FURNACE.—Fig. 1.—Longitudinal Section.

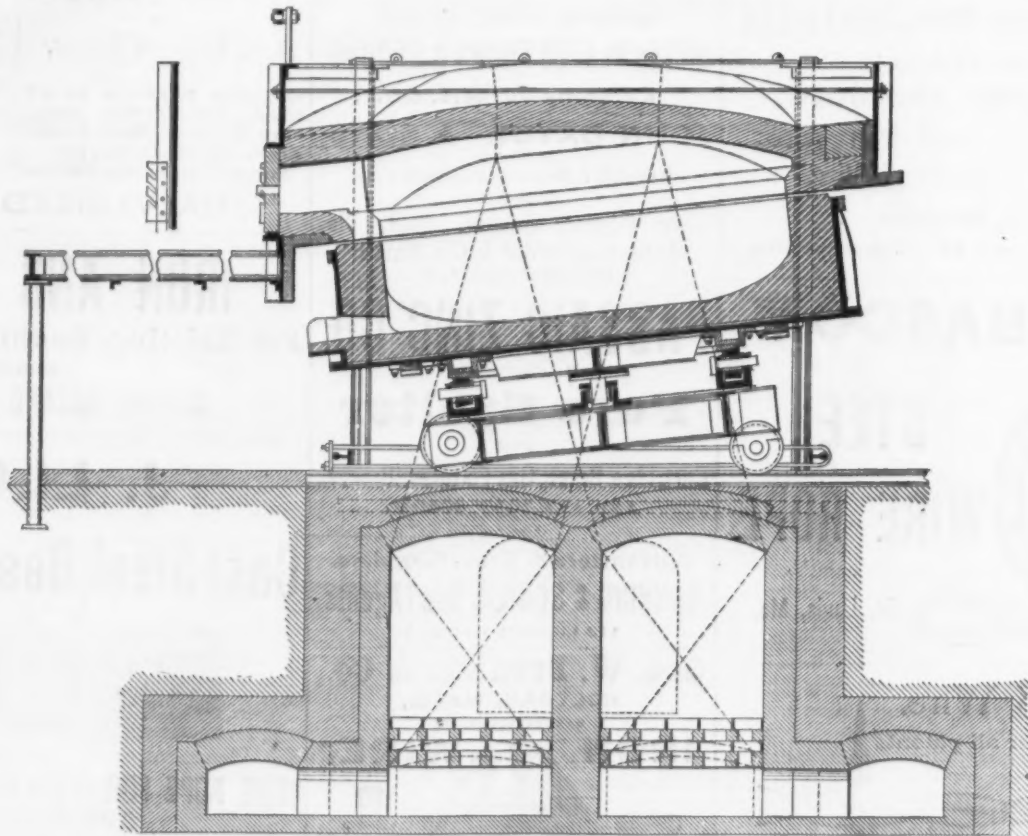


Fig. 2.—Cross Section.

in the slag must be less than 20 per cent.; if it runs from 20 to 30 per cent., only 20 to 30 per cent. of phosphorus can be got out of the iron.

For steel, the pig iron used averages 0.70 to 0.80 in phosphorus; this element, after washing, is reduced to 0.10 to 0.15, and may be still further diluted by pure scrap. Silicon and manganese are reduced to traces. Table I, page 3, gives an average result. A large amount of Fluss-eisen is made, containing phosphorus, 0.15 to 0.20; but the carbon is about 0.08 and the silicon very low. This metal has an elastic limit of 15 to 18 tons,

in 2½ or 3 minutes from the time the iron begins to run into the furnace, the bath rises and the slag flows more or less out of the joint between the revolving hearth and the roof. If the slag rises earlier than 2 minutes, the speed of rotation is decreased. The rising of the bath somewhat represses the bubbling. The rising lasts about 2 minutes; and after it has fallen a little, the carbonic oxide, with its characteristic flame, begins to blow out, the bubbles on the surface of the bath increase largely in diameter, up

* For additional analyses, see The Iron Age, June 5, 1879.

hearth, and the generation of carbonic oxide.

The time of the washing operations witnessed averaged between 5 and 8 minutes. Rich fettling, of course, shortens the time. The tapping, from stopping the rotation of the hearth to opening the tap, averaged 2 minutes, and the time from stopping the hearth to filling the ladle for the open-hearth, or the pig-bed for puddling, averaged 5 minutes.

Running Out.—The washed iron invariably runs out much hotter than it went in; no iron nor slag remain in the furnace. The ladle for one line of open-hearth furnaces

* A paper read at the Montreal Meeting of the American Institute of Mining Engineers, Wednesday, Sept. 17, 1879.

† The analyses of these samples are not yet completed.

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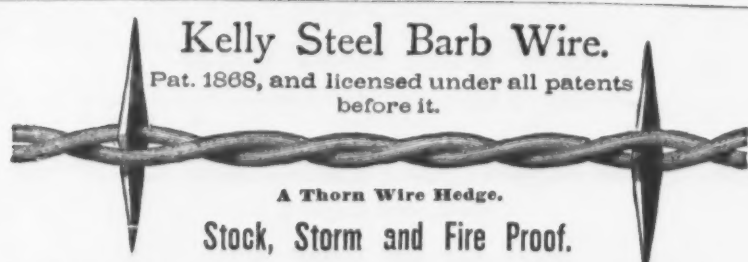
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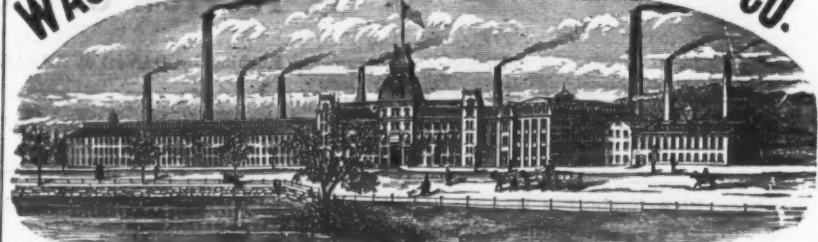
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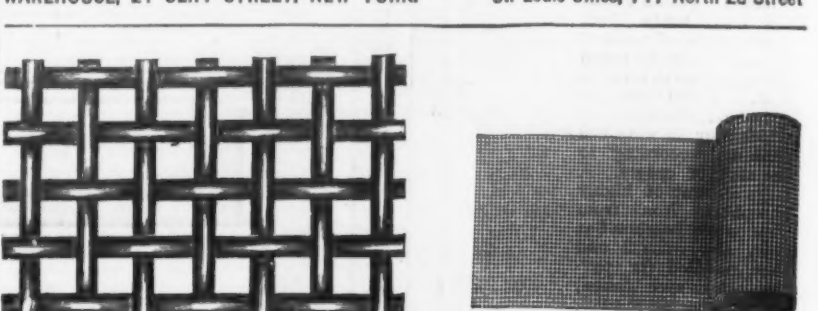
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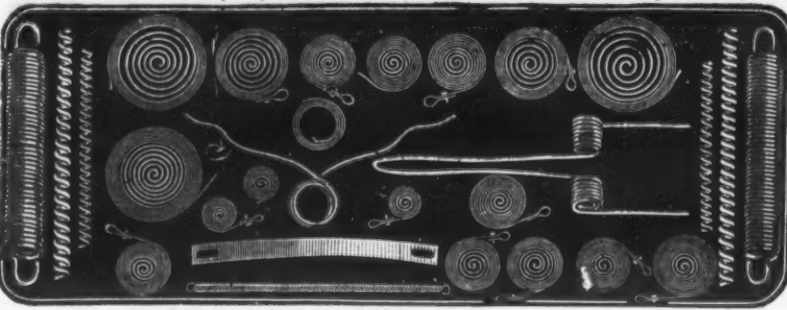
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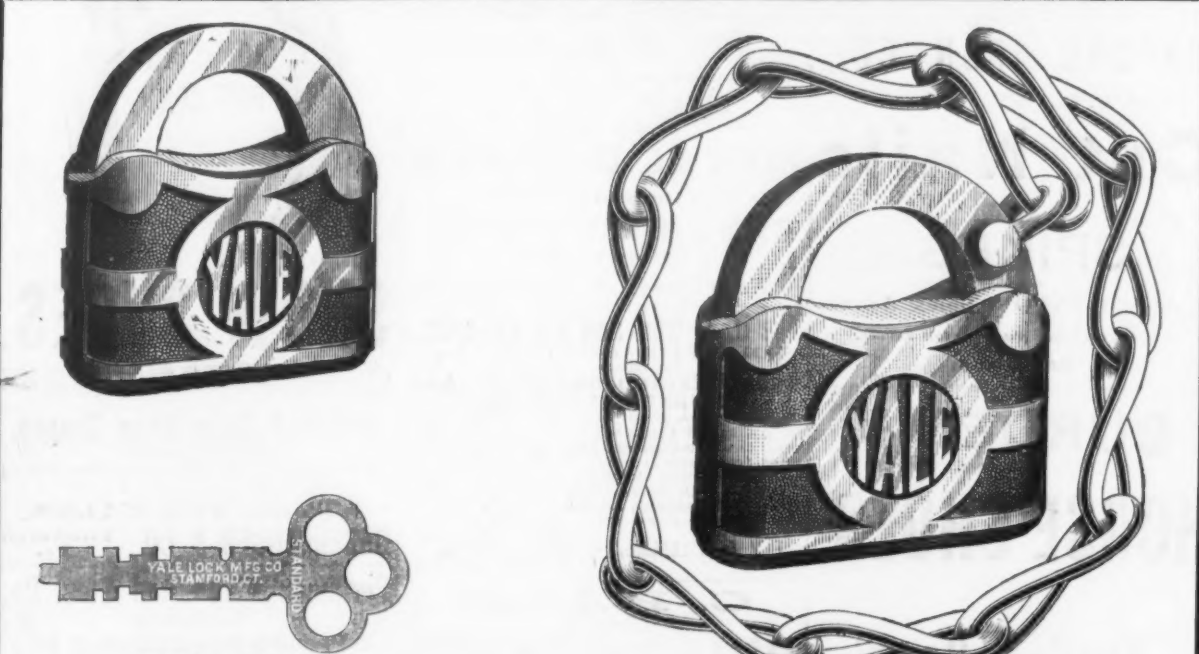
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the results of these experiments (July, 1879), upon which a Krupp license has been taken by the St. Chamond Company. About a dozen charges of Mosele pig, containing phosphorus 1.90, were washed in a Pernot steel furnace, with ore lining, and yielded phosphorus 0.39 to 0.40. Charges of cold-washed pigs 60 to 65 per cent., and hot scrap 40 to 35 per cent., were made into steel in four hours in a Pernot furnace. Messrs. Narjes & Bender, therefore, confidently predict an output of 80 to 90 tons of ingots per 24 hours from washed pig, in such Pernot furnaces as are erecting in the United States.

Puddling.—The washed pig should be run direct from the washer to the puddling furnace. The arrangements at Krupp's works, however, require that it should be remelted in a cupola. The reason of remelting in a cupola rather than in a puddling furnace will be understood by iron makers. It is difficult to keep the washed metal fluid during gradual decarburization. The metal first melted in the puddling furnace comes to nature, and incloses some crude metal, thus preventing its conversion. This might be remedied, perhaps, by more mechanical agitation; but in Krupp's practice, pre-melted metal yields 0.05 to 0.10 phosphorus in the puddle bar, against 0.15 to 0.50 phosphorus from metal melted in the puddling furnace. The temporary cupola used has 2 feet internal diameter, and its product runs direct into the puddling furnace through a movable spout; it runs upon a peel held in at the opposite door, so as not to cut the furnace bottom.

An ordinary double puddling furnace, with a Bicheroux gas apparatus, is fitted in the ordinary way with iron ore, hammer scale, and a little manganese ore; but the manganese ore is sometimes omitted; then a charge of $\frac{1}{2}$ ton is run in. After 15 minutes' rabbling, the iron began to come to nature in the heats observed. In from 29 to 31 minutes the first balls were drawn. The ninth ball was drawn about 3 minutes after the first. The balls were hammered and rolled to puddle bars $\frac{1}{4}$ by $\frac{3}{4}$ inches, which were quite smooth and clean. The washed puddle bars from pig containing from 2.50 to 3 per cent. of phosphorus, were as fibrous, silky and tough as best ordinary puddle bars. The second charge came out 62 minutes after the first. The author kept track of 11 charges made in this furnace between 8 o'clock a. m. and 5 p. m. The fettling averages about 600 lbs. per ton, and the loss on cleaned iron with this small fettling is about 5 per cent., including cupola loss. The wear of fettling is very small, by reason of the very small amount of silica in the bath. This fact would give the mechanical puddler a great advantage with washed iron.

The economy in fuel is also important; for example, at Dillingen, the ordinary practice with Strumm pig is 15 charges of 660 lbs. each, with 1800 lbs. of coal, per furnace per 24 hours. The same pig cleaned yielded 20 charges of the same weight with 1188 lbs. of coal, or 66 per cent. of that used with raw pig. The quality of product was the same as that of $\frac{1}{2}$ Strumm and $\frac{3}{4}$ Nassau, the latter being of high quality.

Conclusion.—The proportion of phosphorus eliminated by this process is not so great as by the Thomas and Gilchrist process; the efficiency, however, of lime linings and additions in the open-hearth is yet to be tested. The Krupp washing has little or no value in connection with the Bessemer process. The Siemens direct process also yields a material adapted to the open-hearth, more free, not only from phosphorus, but from carbon, than the Krupp washed metal, and in better condition to be converted rapidly into steel. The object of this paper is, however, not to compare refining processes, but to give the complete facts about the Krupp process; and it must be admitted that this process is cheap, uniform, convenient, and thoroughly effective within certain limits, and that it is no longer in any sense experimental.

TABLE I.—FRENCH PIG, CLEANED FOR OPEN-HEARTH STEEL.

	C.	Si.	P.	S.	Mn.	Cu.
Raw pig.....	3.30	0.39	0.74	0.09	0.32	0.14
4 min. wash.....	3.27	0.09	0.146	0.094	0.038	0.15
5 1/2 ".....	3.27	0.01	0.146	0.096	0.116	0.14
7 ".....	3.32	0.023	0.106	0.039	0.058	0.143

	Silica.	Oxide of Iron.	Oxide of Mn.	Alumina.	Lime.	Phosphoric acid.	Sulphuric acid.	Copper.
Slag.....	13.0	51.0	16.6	11.6	0.7	6.0	0.2	tr.

	Cleaned pig.....	Steel turnings.....	30 per ct. ferromang.....
Open-hearth charge.....	11,000	1,650	12,650

	C.	Si.	P.	S.	Mn.	Cu.
Steel plate.....	0.10	0.025	0.08	0.03	0.194	0.11

	Tenacity, lengthwise.....	Elongation, lengthwise.....	Tenacity, crosswise.....	Elongation, crosswise.....
Steel plate.....	25.87	39 to 31%	26.30	25%

TABLE II.—ILSEDE PIG, CLEANED WITH ILSEDE ORE, FOR PUDDLING.

	Silica.	Oxide of Iron.	Oxide of Mn.	Alumina.	Lime.	Magnesia.	Phosphoric acid.	Water.
Clg ore.....	4.80	52.60	8.36	1.30	11.73	0.80	3.83	7.90
Slag.....	10.40	41.00	19.30	2.00	7.30	0.70	20.00	1.88

	C.	Si.	P.	Mn.
Raw Pig.....	2.50	0.30	0.23	2.61
Cleaned Pig.....	2.40	Traces.	0.05	Traces.
Puddle bar.....	Traces.	Traces.	0.088	Traces.

TABLE III.—LUXEMBOURG PIG, CLEANED FOR PUDDLING.

	Silica.	Oxide of Iron.	Oxide of Mn.	Alumina.	Lime.	Magnesia.	Phosphoric acid.	Sulphur.	Water.
Cleaning ore.....	7.6	65.0	0.2	3.0	10.2	2.7	2.2	0.1	9.0
Slag.....	9.5	70.3	2.1	4.1	1.9	0.3	11.5	0.3	1.1

	C.	Si.	P.	Mn.	N.
Raw Pig.....	3.40	0.46	0.23	0.18	0.16
Cle'd Pig.....	Trace.	0.59	0.09	0.19	0.38
Pud. bar.....	Trace.	0.05	Trace.	Trace.	Trace.
Pud. bar.....	Trace.	0.15	Trace.	Trace.	Trace.

The Imports of Rails and the Revenue Derived from Them.

Mr. Joseph Nimmo, Jr., Chief of the Bureau of Statistics, has prepared at the request of some French gentlemen who wish to publish a work on American railroads, the following statement of the quantity of rails of all kinds imported into this country, the rate of duty and the amounts realized:

Year ending June 30.	Tons entered.	Rate of Duty.	Amount of Duty Received.
1862.....	6,236.7	\$12 per 2,240 lbs.	\$74,834.06
1863.....	3,712.5	"	44,550.30
1864.....	16,180.8	\$13.10	218,440.70
1865.....	104,229.4	60 cts per 100 lbs.	1,407,096.16
1866.....	5,757.4	70 " "	902,390.83
1867.....	21,526.7	80 " "	289,318.43
1868.....	57,545.5	70 " "	902,390.83
1869.....	105,362.0	" " "	1,552,090.37
1870.....	140,060.1	" " "	2,105,144.09
1871.....	224,085.4	" " "	3,513,658.32
1872.....	288,802.3	" " "	4,528,200.05
1873.....	401,866.5	" " "	6,301,266.44
1874.....	395,388.0	" " "	6,109,622.75
1875.....	32,464.0	" " "	352,232.08
1876.....	189,356.4	Do. less 10 p. c.	2,672,191.18
1877.....	34,726.4	" " "	414,008.27
1878.....	8,812.8	" " "	123,360.5
1879.....	211.6	70 cts. per 100 lbs.	3,316.7
1876.....	272.3	" " "	4,207.67
1877.....	5,115.3	Do. less 10 p. c.	72,100.65
1878.....	1,889.0	" " "	24,573.4
1879.....	553.7	70 cts. per 100 lbs.	8,852.69
1879.....	799.0	Do. less 10 p. c.	11,177.13

Year ending June 30.	Tons imported.	Rate of Duty.	Amount of Duty Received.
1871.....	18,731.3	45 per cent.	\$430,211.85
1872.....	26,056.0	1 1/2 cts. per lb.	790,568.51
1873.....	105,214.3	" " "	2,946,003.11
1874.....	11,407.8	" " "	319,418.73
1875.....	128,317.3	Do. less 10 p. c.	3,233,096.75
1876.....	130,366.9	" " "	2,885,755.26
1877.....	36,170.8	" " "	961,903.52
1878.....	4,919.1	" " "	26,184.77
1879.....	4,914.5	1 1/2 cts. per lb.	137,607.45
1877.....	8.0	Do. less 10 p. c.	24.83
1878.....	1,663.7	1 1/2 cts. per lb.	46,707.71
1879.....	16.5	" " "	52.36
1879.....	2,594.6	" " "	72,649.34

RAILS PARTLY STEEL (STEEL-HEADED).

Year ending June 30.	Tons imported.	Rate of Duty.	Amount of Duty Received.
1871.....	236.0	1 cent per lb.	\$5,886.65
1872.....	4,598.1	" " "	109,600.41
1873.....	40.0	" " "	866.01
1874.....	1,052.9	Do. less 10 p. c.	21,216.18
1875.....	25.3	" " "	511.01
1876.....	15.3	" " "	328.30
1877.....	16.5	1 cent per lb.	368.71
1878.....	29.5	" " "	667.38
1879.....	8.4	" " "	186.47
1879.....	16.5	" " "	369.30

Experiments with Charcoal, Coke and Anthracite in the Pine Grove Furnace, Pa.*

BY JOHN BIRKINBINE.

In the spring of 1878 the Pine Grove Furnace, located in Cumberland County, Pa., was blown in after lying idle for several years. The furnace was constructed in 1770, and for over a century it has been in almost continual operation. The plant consisted in 1877, when the writer was first called there, of a stone stack 32 feet in height, inclosing a shaft and boshes, the latter being 9 feet in diameter. The blast was supplied by two wooden blowing tubs discharging into a third, having a floating piston sustaining a box weighted to give the desired pressure, the power being furnished by a water-wheel. A small 18-pipe hot-blast stove heated the blast. The furnace was remodeled during the winter of '77-'78, and a Weimer blowing engine with a blowing tub 5 feet in diameter and 2 feet stroke, with the necessary boilers, were substituted for the wooden tubs and water-wheel. The stack was raised and enlarged, and provided with a bell and hopper having a central drop. Water dam and tymp were added and general repairs were made. The hot oven, however, was not increased. The furnace had always been operated with charcoal as fuel, and its reconstruction was made with a view to continue the use of charcoal, but provision was made for ample blowing capacity should other fuels at any time be employed.

Although liberal arrangements had been made in cutting wood, the stock of charcoal supplied in 1878 was insufficient for the increased requirements of the remodeled plant, and notwithstanding the purchase of some 80,000 bushels from an adjacent idle furnace, there was not enough to keep the furnace in constant blast until a new supply could be obtained, particularly as the season was unusually backward. Instead of following the established precedent of many charcoal furnace managers—i. e., blow out every February—it was determined to continue in blast, using coke as fuel. Accordingly, when the charcoal stock was exhausted, on March 22, 1879, Connellsville coke was substituted, the change of fuel being made at once; that is, the coke charges followed immediately upon the last charcoal charges. After working a few days, the strike in the Connellsville coke region cut off the supply, and anthracite coal was obtained, a mixture of the two fuels being employed. The strike continuing, anthracite alone was used until a short time before a new supply of charcoal could be depended upon, when the coke shipments were resumed and mixed fuels again were charged. It is seldom that the results of the employment of different fuels in the same furnace under similar conditions are obtainable, and the following data are presented in hopes that they may appear opportunely for the discussion upon fuels, which has been participated in by Prof. John A. Church, of Columbus, Ohio, and England's metallurgical authority, Mr. I. Lowthian Bell. The employment of other fuels than charcoal in a charcoal iron furnace is not presumed to be novel, and may have been experimented with at a number of furnaces; the only authentic information which has been procured is the following:

In the fall of 1853, anthracite coal was substituted for charcoal by the Messrs. Hunter, in the Moselem Furnace, Berks County, Pennsylvania, and its use continued for about 4 months. The furnace was 8 feet diameter at bosh and 31 feet in height, with open top; the blast being furnished by

* Read at the Montreal meeting of the American Institute of Mining Engineers.

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water power and heated in a stove. One tuiere was employed with charcoal, but a second tuiere was added when anthracite was used, these tuyeres being placed 22 inches above the bottom. From 35 to 45 tons of iron (mostly foundry) was made per week, with a consumption of from 2½ to 2½ gross tons of anthracite. The output of the furnace was greater with anthracite than with charcoal, the yield with the latter fuel being from 26 to 35 tons per week, but the consumption of fuel per ton of iron was much greater with the anthracite. Mr. Nicholas Hunter, who kindly furnished the above information from memory, also states that 2½-inch nozzles were used in each case, the tuyeres being open when charcoal was used and closed when anthracite was charged. When making charcoal iron the lime charge was 15 to 20 per cent. of the ore charge; with anthracite this was increased to from 35 to 50 per cent. Unfortunately, the books of record of this furnace are believed to have been destroyed, and data in detail could not be obtained. It is, however, evident that the increased yield with anthracite was made by driving the furnace at the expense of fuel.

At the Philadelphia meeting in 1873, Mr. T. F. Witherbee presented a paper before the Institute upon the manufacture of Bessemer pig metal at the Fletcherville Charcoal Furnace, near Mineville, Essex County, N. Y., in which mention is made of the substitution of anthracite for charcoal toward the close of 1871. (See Transactions, vol. ii., page 71 to 75.)

In 1873 Mr. S. M. Krauser changed the fuel in the Port Leyden Furnace, Lewis County, N. Y. The only record of this change which could be obtained is from a letter to the Secretary of the American Iron and Steel Association, viz: "We blew in with charcoal and made 400 tons; then filled with anthracite coal and made 607 tons; then changed to charcoal again, and we are still blowing."

Col. George B. Weistling, a member of the American Institute of Mining Engineers, had also used coke, but only for a short time, closing out a blast with charcoal at Mont Alto Furnace, Franklin County, Pa. It is to be regretted that full data of these experiments could not be obtained for comparison with those herewith presented.

The Pine Grove Furnace has a bosh 9 feet 4 inches in diameter and a working height of 36 feet 6 inches: the tunnel head is 5 feet in diameter, closed by bell and hopper, the former being 3 feet in diameter. The crucible is 50 inches in diameter and 5 feet in height, pierced for 3 tuyeres at a height of 3 feet from the bottom. There is no fore-hearth. The lining and bottom are of fire-brick. The temperature of the blast in all the experiments was between 500° F. and 700° F., the average being 600° F. It was nearly constant, because, owing to the small size of the oven, it was continually worked to its utmost.

For some time previous to the use of coke as fuel, the charcoal used was mainly from the stock purchased from a neighboring idle furnace, and was deteriorated by the re-loading, hauling by wagons and railroad and the inclemency of the weather. The consumption, therefore, was above the proper working of the plant; nor was the output as great as it has been. To place results upon an equitable basis as possible, comparison will be made with the operation of the furnace during the month of February, 1879, the last full month before the change in fuel was made, which was as follows:

Average blast per minute in cubic feet... 195
Average blast per minute in lbs. per square inch... 47.7
Average weekly make of pig iron in tons (2560 lbs.)... 95
Pounds of charcoal consumed per ton of iron... 2534
Cubic feet of air delivered per lb. of charcoal... 77.8
Cubic feet of air delivered per ton of iron made... 197,084
Tuyere area in square inches... 47.7
Average yield of ore per cent... 38.26
" per cent. of lime to ore charge... 22
Ore and flux carried by 1 lb. of fuel... 2.8

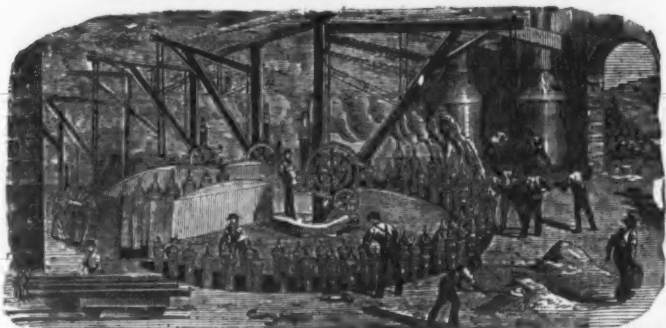
When the last charcoal was charged the furnace was working upon the following: 378 lbs. charcoal, 880 lbs. Pine Grove No. 1 ore, 200 lbs. limestone. Number of revolutions of engine, 23, equivalent to 1806 cubic feet per minute. Pressure of blast, 0.6 lbs. through three 4½-inch nozzles. Average product per week, 90 tons. On March 23d, 1879, at 2 a. m., the charge was changed to 500 lbs. coke, 750 lbs. Pine Grove No. 1 ore, 375 lbs. limestone. As the coke descended in the shaft of the furnace there was no appreciable difference in the pressure of blast; and at 5 p. m., 15 hours after coke was first charged, the revolutions of the engine were increased from 23 to 28 without any increase of pressure. At 10 p. m., the revolutions were 32, and the pressure 1½ lbs. The following day, owing to an accident to the water supply, two tuyeres were lost, and at that time three 3½-inch nozzles were substituted for the 4½-inch nozzles, which had continued in use up to this time. With the necessary trials to obtain best results, work could not be expected to be very regular; however, after the third day there was no serious trouble, and coke continued to be charged up to April 1, when the record was as follows: Coke, 500 lbs.; Pine Grove No. 1 ore, 950 lbs.; limestone, 380 lbs.; revolutions of engine, 33, equal to 2592 cubic feet per minute; pressure, 1½ lbs. through three 3½-inch nozzles. The strike of the Connellsville region necessitated that the coke be husbanded, and a charge in coke and anthracite coal was substituted. During the ten days coke alone was used, the furnace received 687 charges, aggregating 346,000 lbs., or 8650 bushels of coke; 247.2 tons Pine Grove No. 1 ore, 109.7 tons limestone, and made 99 tons of iron, which, reduced to quantities per ton of iron, are equivalent to 3494 lbs. = 87.35 bushels coke; 2.50 tons Pine Grove No. 1 ore; 1.1 tons limestone; 323.845 cubic feet air = 92.66 cubic feet air per pound of coke consumed. Average pressure of blast, 1 lb., maximum 1½ lbs.; of ore and flux were carried by 1 lb. of flux.

When it became necessary to use anthracite with the coke the tuyere nozzles were reduced to 2½ inches, and at 9 p. m., April 2, the following charge was substituted: 500 lbs. anthracite coal, 80 lbs. coke, 950 lbs. Pine Grove No. 1 ore, 475 lbs. limestone.

* No. 1 ore refers to ore from No. 1 bank; No. 2 ore to ore from No. 2 bank.

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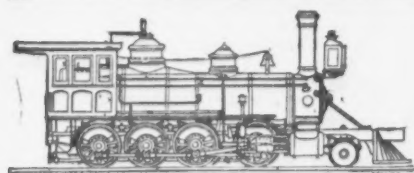
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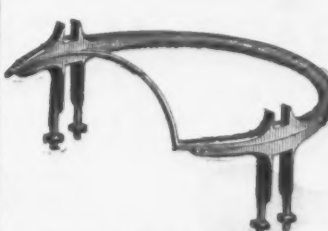
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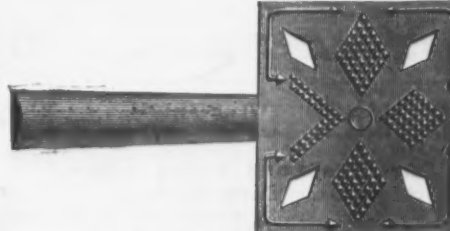
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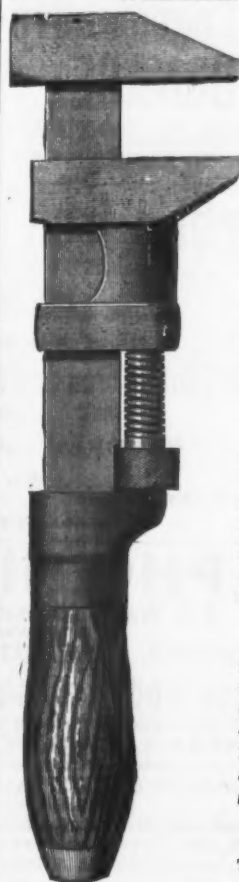
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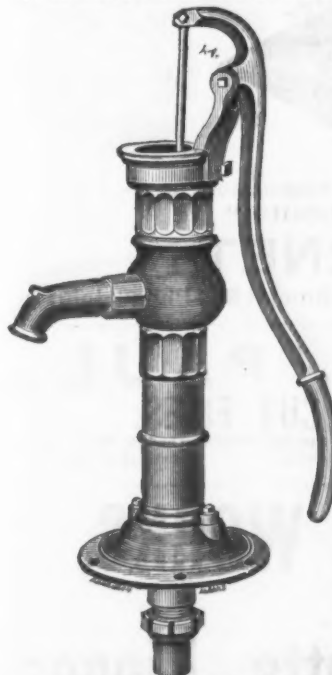
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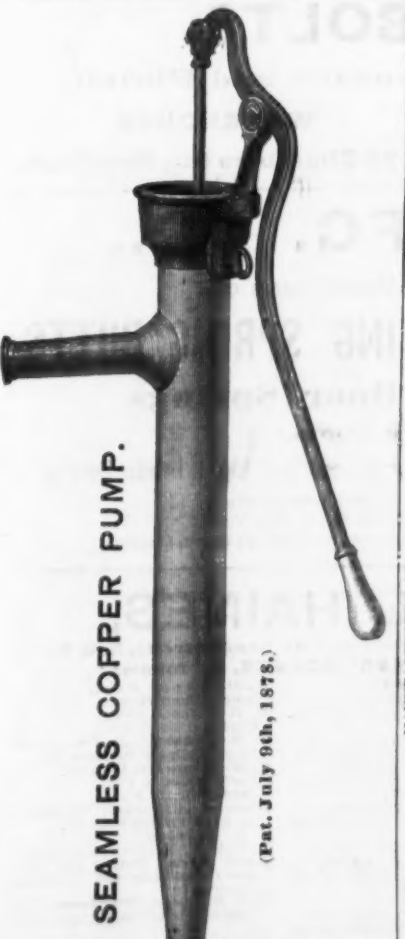
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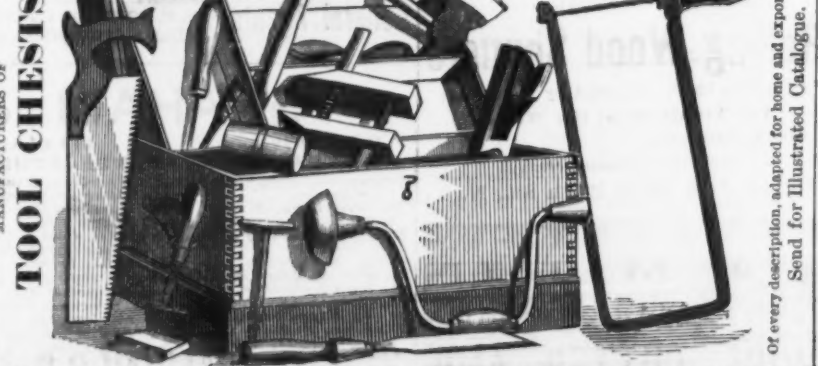
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Revolutions of engine 34 = 2670 cubic feet
per minute. Pressure 1 1/4 lbs. through three
2 1/2-inch nozzles. In this instance the ac-
tion of the blast was quite different from that
when the coke charges followed those of
charcoal, for, as the anthracite descended in
the shaft of the furnace, the pressure in-
creased.

The following is a record of the pressure
gauge April 2 and 3, 1879:

April 2, 9 p. m.	Revolutions	34.	Pressure 1 1/4 lbs.
10 p. m.	"	34	"
11 p. m.	"	34	"
April 3, 1 a. m.	"	34	"
3 a. m.	"	34	"
8 a. m.	"	34	"
10 a. m.	"	34	"
12 noon.	"	34	"

It continued at this pressure until 5 p. m.,
when the revolutions were increased. A
careful estimate showed that the anthracite
would be at work at 2 p. m., but the maxi-
mum pressure at 34 revolutions was reached at
noon. The increase due to the resistance of
the stock was, therefore, 1 1/2 lbs. greater
with anthracite mixture than with coke
alone. Up to this time no changes had been
made in ores, nor were any made until April
6, when a mixture of ores from the Pine
Grove banks, Nos. 1 and 2, and magnetic
ore from the Fuller mine, near Dillsburg,
were employed. For 10 days up to April
11 the same mixture of fuels was continued,
but the impossibility of obtaining coke
necessitated a dependence upon anthracite
alone. During these 10 days the engine had
been run at an average of 35.5 revolutions
and an average pressure of 4 1/4 lbs.

The following is a record of the work with
mixed fuels, the average mixture being 81.5
per cent. anthracite, 18.5 per cent. coke:
322,600 lbs. anthracite and 73,160 lbs. coke,
making a total of 395,760 lbs. fuel consumed
in making 112 1/2 tons of iron; 292.3 tons of
mixed ores and 145.26 tons limestone were
charged in this time. Therefore, to make a
ton of iron the following quantities were
required: 3473 lbs. of fuel, 2.6 tons of ore,
1.29 tons limestone, 338,187 cubic feet of
air = 96.13 cubic feet per lb. of fuel; 2.47
lbs. ores and flux carried with 1 lb. of fuel.
When the last charge of mixed fuels was
put into the furnace the charge was changed
to 600 lbs. anthracite, 860 lbs. Pine Grove
No. 2 ore, 90 lbs. magnetic "Fuller" ore,
525 lbs. limestone. Revolutions of engine,
34; pressure, 4 lbs. through three 2 1/2-inch
nozzles. During the time the anthracite
pressure increased to 4 1/4 lbs., demonstrat-
ing how a small amount of coke (1-7th) had
aided in keeping the furnace "open." With
no extraordinary disturbances the furnace
continued on anthracite alone as fuel from
April 12 to May 4, a period of 23 days;
there were some changes in burden and
volume of air, but the quantities were in
general constant, except that the limestone
was reduced to 475 lbs. and No. 2 ore only
was used; the records of the two days men-
tioned are identical. During this time,
however, about 10 tons of scrap which had
accumulated about the plant was charged
into the furnace, and in all estimates it is
taken as 90 per cent. ore.

The record of the 23 days' blast with an-
thracite as fuel is: Average pressure of
blast, 4 1/4 lbs.; maximum, 5 1/4 lbs.; 1236
charges aggregated 331 tons coal, 480 tons
ore, 227.6 tons limestone, 10 tons scrap,
which produced 191 1/2 tons of pig iron,
and gives the following quantities per ton
of pig iron: 3871 lbs. (1.728 tons) coal, 2.63
tons ore, 1.19 tons limestone, 398,679 cubic
feet of air = 103 cubic feet of air per pound
of coal, 2.14 lbs. of ore, scrap and flux, car-
ried by 1 lb. of coal. Average per cent. of
ore, 38; average lime burden, 47.4 per cent.

From May 5 to May 23 coke was added
to the anthracite, shipments having been
resumed, and at the latter date, the an-
thracite stock being exhausted, coke alone
was charged for two days, until that, too, was
used up, when the furnace returned to
charcoal as fuel, and has continued to use
it to the present time.

On May 5 the charge of the furnace was
made 125 lbs. coke and 450 lbs. anthracite
(instead of 600 lbs. anthracite, which had
been the basis up to this time), 950 lbs. Pine
Grove No. 2 ore, 475 lbs. limestone. Revo-
lutions, 34; pressure, 4 1/4 lbs. Although no
change was made in the speed of the engine,
the pressure gradually fell to 3 1/4 lbs.

On May 10 the proportions of the fuel were
changed to 235 lbs. anthracite and 285 lbs.
coke; the pressure gradually fell until at 34
revolutions it was 2 1/2 lbs. The working of
the furnace necessitated a reduction of bur-
den to 850 lbs. Pine Grove No. 2 ore and 425
lbs. limestone, the revolutions being re-
duced to 30 and the pressure to 1 1/2 lbs.
Several minor changes in the proportions of
coke and anthracite were made to clean up
stock, and on May 22 the charge was made
500 lbs. of coke until it, too, was consumed.
The operation of the furnace working for
the last two days on coke alone showed a
marked decrease in pressure, which at 32
revolutions was 1 1/4 lbs. Taking the entire
period from May 5 to May 23 as working on
mixed fuels, the following results are ob-
tained: 1171 charges were hoisted, aggregat-
ing 161.4 tons anthracite, 135 tons, or 7560
bushels, of coke; 460.36 tons Pine Grove No.
2 ore, 3 tons scrap iron, 230.16 tons limestone;
and 203 tons of pig iron were made, which
reduced to quantities per ton of iron give:
2.3 tons of Pine Grove No. 2 ore; 1.13 tons of
limestone; 1.46 tons of fuel = 3217 lbs.
(55 per cent. of anthracite and 45 per
cent. of coke); 317,170 cubic feet of air =
99.3 cubic feet per lb. of fuel; 2.35 lbs. ore
and flux carried by 1 lb. of fuel. Average
pressure of blast, 2 1/2 lbs.; maximum, 4 1/4 lbs.

The anthracite coal used was medium soft,
and of "steamboat" size. In dividing the
various casts of pig iron and crediting them
to the different fuels, due allowance was
made for the "driving" of the furnace. In
estimating this a given weight of charcoal
was assumed as occupying double the space
of the same weight of coke, and four times
the space of the same weight of anthracite.
Allowing for difference in ore and lime bur-
dens, a practically correct estimate was thus
made. The most rapid driving of the fur-
nace during February when running on char-
coal was 12 1/2 hours; when running on all
coke the best day's record showed the stock
to have been 20 1/2 hours in the furnace; when
using 81 1/2 per cent. anthracite and 18 1/2
per cent. coke the fastest driving was 22
hours, while with anthracite alone it

was 31 hours, and with 55 per cent. anthra-
cite and 45 per cent. coke it was 25 hours.

During the month of August, 1879, the
furnace "drove," so that stock did not re-
main in it but 9 1/2 hours—this was with
charcoal as fuel. There was no attempt to
make a gray iron for foundry purposes, as
the market for the charcoal pig iron is en-
tirely confined to charcoal forges, and for
the iron made with anthracite coke or mixed
fuels the demand was for mill iron. The
records here given are not offered as ex-
traordinary, nor is it claimed that experi-
ments over such brief periods can establish
any fair ratio of value for the different
fuels. The first ten days, during which
coke was used, were partially consumed in
trials, and are therefore unfair to this fuel;
and in none of the experiments was the fur-
nace run for a sufficient time to make an
equitable comparison. No allowance for
leakages was made in calculating the air
consumption, and the results obtained are
presented more for comparison than to de-
monstrate the actual amount of air used.
There were no defective parts, and the leak-
ages were only such as exist in any furnace
in good working order, and those occasioned
by snuffing tuyeres, opening notches, &c.,
which are difficult to determine.

The following table is merely a recapitula-
tion of data heretofore given, placed in a
convenient form for investigation. All the
figures given are averaged for the time the
fuel mentioned at the head of the columns
was used. The tons are 2260 lbs. each for pig
iron, 2240 lbs for everything else:

Items from Record of Working.	Charcoal, Feb., 1879.	All coke, March 22 to April 2, 1879.	81.5 pr. cent. anthracite, April, 1879.	All anthracite, April & May, 1879.	Anth. 55 per cent., coke 45 pr. cent., May, 1879.	Charcoal, August, 1879.
Pounds of fuel consumed per ton of pig iron.	3,871	3,404	3,473	3,871	3,271	2,656
Pounds of ore and flux carried per ton of pig iron.	2,630	2,630	2,630	2,630	2,630	2,630
Pounds of limestone consumed per ton of pig iron.	1,190	1,190	1,190	1,190	1,190	1,190
Percentage of iron made per week, average.	38.56	40	38.56	40	38.56	40
Percentage of iron made per ton of fuel.	38.56	40	38.56	40	38.56	40
Percentage of iron made per ton of ore.	38.56	40	38.56	40	38.56	40
Average cubic feet of air per ton of iron.	103	103	103	103	103	103
Average pressure of blast in pounds.	4.75	4.75	4.75	4.75	4.75	4.75
Lost time that square inches.	47.4	47.4	47.4	47.4	47.4	47.4
Duration of Experiments, days.	28	10	20	20	20	10

The Volume of the Window Glass Trade of the United States.

At the beginning of the present season the President of the Window Glass Manufacturers' Association issued a circular, copies of which were sent to all the members of the association, which includes all the manufacturers of the United States. The object of the circular was to obtain full information showing the condition and prospects of the trade. From replies received information was prepared in tabulated form, and privately printed and circulated among those in the business. These tables show that with 68 furnaces and 569 pots in the country there were in operation for a quarter, last season, 484 pots, while the estimate for 1879 and '80 is that 546 will be run—in fact, are practically now running. The following table presents these facts in a comprehensive form:

Districts where located.	No. of Fur- naces.	No. of Pots.	No. of Pots for less than 1878-79.	Est. No. to be run in 1879-80.
New York and Massachusetts.	11	69	72	73
New Jersey and East Penna.	13	104	104	104
Baltimore.	5	42	34	34
Pittsburgh.	21	192	164	192
Western States.	18	162	110	146

Besides the above facts, an interesting statement is given of the number of boxes made in the past two seasons, showing how the trade last year fell off from the year previous, as follows:

No. of boxes made in 1877-78.	1,561,368
No. of boxes made in 1878-79.	1,473,837
Falling off.	97,531
Of course no estimate could be given of the number of boxes to be manufactured in 1879-80.	

The following summary of maximum averages of speed now made on the different lines of England, may be of interest as bearing upon the subject of high speed, much discussed of late.

Miles.	Miles.
Great Western.	53 1/2
Great Eastern.	51
London & Brighton.	47 1/2
London & North Western.	47 1/2
Midland.	40
London, Chatham & Dover.	45
South Eastern.	45
Great Eastern.	44
London & South Western.	44

The production of spelter in Silesia during the year 1878 was 1,192,719 cwt. The following five works were the largest producers, none of the remaining twelve reaching 35,000 cwt.:

	Cwts.
Silesiahuette.	324,500
Wilhelmine und Paulshuette	228,064
Antonien und Georgshuette	163,841
Hohenloehshuette.	128,066
Gottlieb und Berbeckshuette.	116,931

On September 1, James Hooven & Sons, Norristown, Pa., increased the wages of their puddlers to \$4 per ton, and of their other hands, 7 per cent.

A. FIELD & SONS,

TAUNTON, MASS.,

MANUFACTURERS OF

AMERICAN AND FRENCH WIRE NAILS, TACKS, SHOE NAILS, And Every Variety of Small Nails.

Offices & Factories at Taunton, Mass.

Warehouse at 78 Chambers St., New York,

where may be found a full assortment of Tacks, Brads, Wire Nails, &c., for the accommodation of the New York Wholesale and Jobbing Trade.

Any variations from the regular size or shape of the above-named goods made from sample to order.

A SILVER MEDAL has been awarded above goods at the Paris Exposition, being the only medal awarded any American manufacturer of Tacks and Wire Nails.

Hoisting Machinery
MANUFACTURED BY
CRANE BROTHERS MFG. CO.,
Chicago.

STAR LOCK WORKS.
ESTABLISHED 1836.

Trunk Locks, Door Springs,
Pad Locks, Trunk Stays,
Dead Latches, Keys, &c., &c.
110 South 8th St., and Sanson, bet. 8th
and 9th, PHILADELPHIA.

PATENTED
Scand. Pad Locks.
With Flat Keys.
Shackle secured to
the Lock Box.

HILLEBRAND & WOLF.

A. A. WEEKS,
Manufacturer of
Hardware Specialties,
82 John St., New York.

REDUCTION IN PRICE LIST
FOR THE FALL TRADE.
AMERICAN MINCING KNIFE,
BEST AND CHEAPEST.

WITH
ONE, TWO
and
Three Blades.
Pat. Feb. 11, 1879.

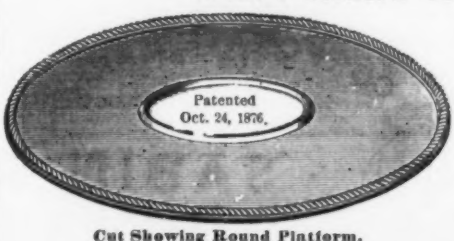
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tion.
PHILADELPHIA NOVELTY MFG. CO.,
321 Cherry Street, Philadelphia, Pa.

CLOTHES WRINGERS.

**"EUREKA"
WRINGER.**
BOSTON.

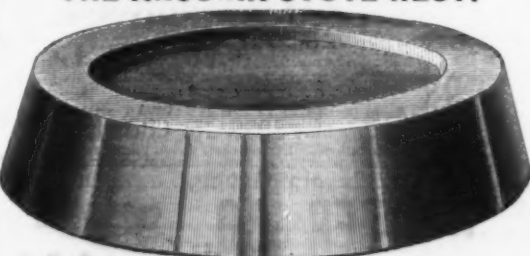
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BOSTON, MASS.

THE ANSONIA CORRUGATED STOVE PLATFORM,
With Patented O. G. Border.



Cut Showing Round Platform.

THE ANSONIA STOVE REST.



This Cut is the Actual Size of 2-inch.

ANSONIA BRASS AND COPPER CO., 19 Cliff St., New York.

NEW YORK BELTING AND PACKING COMPANY,
The oldest and largest manufacturers in the United States of
Vulcanized Rubber Fabrics
In Every Form, Adapted to Mechanical Purposes.



CABLE ANTISEPTIC COTTON HOSE. Patented July 6, 1873. This is a rubber-lined, extra heavy Cotton Hose, woven seamless in a peculiar manner, to insure compactness and durability. The 3-ply weighs 40 lbs to the section, and has been tested to 400 lbs. It is the lightest and most durable seamless Cotton Hose in the market. For use on Hand or Steam Fire Engines.
ANTISEPTIC LEXEN AND RUBBER-LINED LEXEN HOSE. A cheap and durable article for mining, mill and factory purposes. Will stand a pressure of 300 lbs. per square inch.
CAUTION.—Our name is stamped in full on all our best Standard Belting, Packing and Hose. Buy that only. The best is the cheapest.
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JOHN H. CHEEVER, Treasurer.
Price lists and further information may be obtained by mail or otherwise on application.

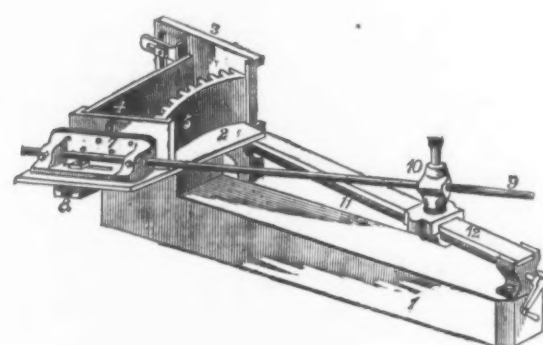
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Hydraulic Jacks
AND
Punches.
Roller Tube Expanders and Direct Acting Steam Hammers.
Communications by letter will receive prompt attention.
Jacks for pressing on Car Wheels or Crank Pins made to order.

Felthousen's Gear Wheel Mold-Former.

The accompanying illustrations show an apparatus invented by John H. Felthousen, of Baltimore, for forming molds for casting gear wheels and other circular or annular bodies. In the figures, 2 represents the bottom or table of the mold-former, which is firmly fixed upon an upward projecting portion of the foundation or base, 1. A vertically adjustable wall, 3, can be raised or lowered at one end of the table in a radial plane with the center pin, 10. The latter is fixed on a carriage, the distance of which from the inner edge of the wall may be adjusted at will. Upon this pin swivels a hub, through which passes the adjustable rod, 9, carrying at its outer end an abutment, 7. This serves to support a facing board, 6, which forms the other end wall of the mold-former and is adjustable to the wall, 3, by means of the swinging of the center block through which the rod, 9, passes. Both the end walls, 6 and 3, have lips projecting inwardly, which serve to support the pattern. The figure, 4, indicates a back board or wall, which is supported in a vertical position by a lip on the wall, 6, and an adjustable stop on the wall,



FELTHOUSEN'S GEAR WHEEL MOLD-FORMER.

3. It is in the space inclosed between the walls, 3, 4, 5 and 6, that the sand is rammed for forming the sections of the mold, which is then to be placed together in the usual manner. The segmental pattern may be formed on any arc, and of any width of face for wheels with plain rims, such as fly and belt wheels, or for gear wheels of either internal or external teeth, mortice or bevel wheels. After the sand has been properly rammed, the adjustable wall, 3, is lowered and the pattern, 5, wall board, 6, and back board, 4, are removed and the section set aside, and so on until enough are completed. When it is desired to change the adjustment of the former, so as to form a mold of an arc struck from a different center from that for which it has been used, the pin carriage is moved to or from the table, 2, by means of a screw-rod, 11, which passes through a part of the carriage and has suitable end bearings, so that the pin will form the center of the desired circle, and the rod, 9, can be swung to regulate the distance between the walls, 3 and 6, to suit the length of pattern. The rod, 9, is secured in the swiveling-hub by a suitable thumb-screw, and the abutment, 7, is held to the table, 2, by a clamp-bolt, 8, passing through longitudinal slots in the abutment and table.

Test of a Smoke-Consuming Apparatus at the Pittsburgh Exposition.

The boilers supplying steam for the running of the machinery at the Pittsburgh Exposition, which is now in progress, have been fitted with a smoke-consuming furnace, the invention of Dr. H. M. Pierce of Grand Rapids, Michigan. The furnace in question was patented in July last, and grew out of a method he has perfected for burning soft coal and other bituminous fuel in his own factories.

He claims his furnace to be constructed on strictly scientific principles; that it effects a perfect combustion of fuel; that it makes a saving of at least 33 per cent. of fuel over results of furnaces now in use generally; that it utterly prevents smoke, and is of cheap and durable construction.

For the purpose of arriving at carefully made and reliable data as to the working of this furnace and its economy of fuel, a committee of experts was appointed by the managers of the Exposition to make a thorough and scientific test. This committee was composed of James Park, Jr., D. W. C. Carroll, Reuben Miller, Wm. Wade, W. M. Lyon, H. F. Mann, Prof. S. A. Lattimore, L. L. D., of Rochester (N. Y.) University, Capt. O. E. Duffy, Prof. F. Phillips, of Western University, Lieut. F. A. Mahan, of the U. S. Engineer Corps, Hon. A. J. Sweeney, J. H. McElroy and Hon. D. J. Morrell.

clinkers were weighed. During the experiment the temperature of the rear of the first and third boilers and of the uptake was registered every 15 minutes, and the coal and water used were carefully measured. The result of the day's experiments are as follows:

Duration of experiment, hours.....	3
Grate area, square feet.....	32
Evaporating surface, feet.....	1,537
Pounds of coal fed to furnace.....	910
Pounds of ashes and refuse.....	235
Pounds of combustibles.....	1,322
Water fed to the boilers, lbs.....	9,854
Pressure of steam, lbs.....	105
Temperature of feed water.....	63°
" " chimney gas.....	544°
" " atmosphere.....	64°

ECONOMIC PERFORMANCE.

Pounds of water evaporated per pound of coal from 63°.....	6.33
Pounds of water evaporated per pound of coal from 212°.....	7.55
Pounds of water evaporated per pound of combustibles from 63°.....	7.45
Pounds of water evaporated per pound of combustibles from 212°.....	8.85
Percentage of ashes and refuse.....	18

The combustion of the fuel and gases was perfect and no smoke was produced. After the experiment was finished the boilers were carefully examined inside and outside. On

the outside was found a whitish-gray deposit 1-64th of an inch thick. In the flues was found a light, dry, flaky soot, which apparently contained no oily matter. With these exceptions the boilers and flues were found to be clean and in good condition. While the furnaces were built to employ heated air, none was used during this experiment. Respectfully submitted on behalf of the Committee.

JOHN H. McELROY, Chairman; S. A. LATTIMORE, O. E. DUFFY, F. A. MAHAN.

On the 2d day of August a committee was appointed to test this furnace at the Bangor Chemical Works, Bangor, Mich. Their report is as follows: The furnace was under a new boiler 5 feet in diameter, 16 feet in length, containing 54 three-inch tubes, with a grate surface of 16 1-5 feet. The boiler with which the new furnace was compared, was a boiler of the same manufacture and same dimensions, with same surface exposed to the fire, with 24 1-5 feet of grate surface, and had been in use two years, and was in good order, and was set after the usual manner of setting boilers.

The first test was to ascertain comparative amount of wood consumed in equal time by the two boilers when doing equal amounts of work under equal pressure. The fuel used was seasoned maple wood of first quality.

Length of test, hours.....	6.5
Old furnace consumed, lbs.....	3,520
New furnace consumed, lbs.....	2,820
Difference favor of new, lbs.....	700
Saving in favor of new, per cent.....	20
Steam pressure on each boiler, lbs.....	72
Some smoke from old furnace.	
No smoke from new furnace.	

The following shows the evaporative power of the new boilers:

Time of test, hours.....	4.45
Coal consumed (Pittsburgh coal), lbs.....	728
Pounds of water evaporated.....	8,792
Pounds of water evaporated to each pound of coal.....	11
Pressure of steam, lbs.....	80
Temperature of water as fed to boilers.....	59°

No allowances were made for temperature or refuse. No smoke from furnace. The third test shows the comparative quantity of Pittsburgh coal consumed by the two boilers in equal time when doing equal amount of work under equal pressure:

Time of test, hours.....	2
Old furnace consumed, lbs.....	482
New furnace consumed, lbs.....	126
Less amount consumed by new furnace, lbs.....	156
Saving in favor of new furnace, per cent.....	30 9-10

A little smoke from new furnace at starting, none afterward. Smoke from old furnace as usual.

On October 1, 1879, a test of the evaporative powers of the boilers set after the ordinary method, and in use at Davis dam, was made. There were present Lieut. F. A. Mahan, U. S. A., H. M. Pierce, L. L. D., John R. Meredith, Master Mechanic, Wm. B. Rogers, Engineer, Dennis Church, M. D., Samuel S. Fuller and E. H. Harding. The experiments were conducted by Mr. Wm. Meredith, Mr. Rogers and Dr. Church, Mr. Harding keeping the record.

The result of the experiment was as follows:

Length of time of test, hours.....	5
Grate area, feet.....	32
Evaporating surface, square feet.....	1,506
Pounds of coal fed to furnaces.....	2,475
Water fed to the boilers, lbs.....	12,520
Pressure of steam, lbs.....	105
Temperature of feed water.....	63°

ECONOMIC PERFORMANCE.

Pounds of water evaporated per lb. of coal from 60°.....	5.06
Pounds of water evaporated per lb. of coal from 212°.....	6.04

The fire at the close of the test was as nearly as possible in the same condition as

Cutlery.

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Manufacturers of
PEN AND POCKET CUTLERY,
Solid Steel Scissors, Shears, Razors, &c.
Sole proprietors of the renowned full concave patent
"ELECTRIC RAZORS," Nickel Plated
And the celebrated "ELECTRIC SHEARS." Hobs.
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AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.
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MERIDEN CUTLERY COMPANY.

THE "PATENT IVORY" HANDLE TABLE KNIFE.

It is oldest manufacturers of Table Cutlery in America. Exclusive makers of the CELLULOID HANDLE
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Absolute Safety!
Perfect Ease!
Time, Labor and Ma-
terial saved by using the
NICHOLS ACID PUMPS,
to draw all kinds of acids from
carboys. Every pump war-
ranted. Send for new circular
and price list. Manufactured
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Acid Pump & Siphon Co
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Champion Clothes
Line Hook.

This Hook has many points of ad-
vantage over anything offered, being
easy put up, holding the line firm;
and a line can be put up and taken
down without tying or untying, and is
cheap.
Manufactured only by

ENTERPRISE MFG. CO.,
Geneva, Ohio.

J. RUPERTUS' SINGLE BREECH-LOADING SHOT GUN, 12, 14 & 16 Bore.



The best and cheapest single Breech-
Loader in the market. Fine twist bar-
rels and rebounding locks. Price, \$15;
discount to the trade.
Sole agent,

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90 Chambers St., New York.

Cutlery.

ALFRED H. HILDICK,
12 Warren St., N. Y.,
Importer of CHAINS, ANVILS, VISES, &c.
Agency of
HILL BROTHERS & CO., WALSALL, ENGLAND
GENERAL HARDWARE MERCHANTS,
And of
BALL'S PAT. SOLID STEEL SHEEP SHEARS.
These shears are unsurpassed for cheapness, dura-
bility and utility. They are made of one solid piece
of steel from point to point, and cannot be broken in
use either in the bow or at the junction of the shank
and blade. Samples can be seen at above address, or
sample lots furnished.

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productions having considerably increased, they
have, in order to meet it, greatly extended their
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Having largely increased our facilities for the manu-
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the trade at a large reduction from our former
prices. The list price of the large size is now \$12.00
per dozen, formerly \$18.00, and the small size, \$8.00,
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facture of Young's Patent Folding Scissors is the
very best. All are nickel-plated and furnished with
a neat morocco case.

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IMPORTERS OF

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Pocket Knives and
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A large stock of

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Successors to

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Manufacturers of

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Screw

Wrenches.

PATENTED,

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December 26, 1871.

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The back strain when the wrench is borne
by the bar—not by the handle.
The strongest Wrench made, and the only suc-
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None genuine unless stamped

A. G. COES & CO.,

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New York, carry a full line of our goods, and will be
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Kangaroo Sheep Shears,

The best Every
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SEYMOUR'S SHEARS AND SCISSORS.

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Manufacturers of

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Solid Cast Steel Pump Augers

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For Boring PUMP LOGS. All sizes in stock
Socket Shank, Ring Handles, and Connecting
Rods for the above to order. Also Tapering Tools
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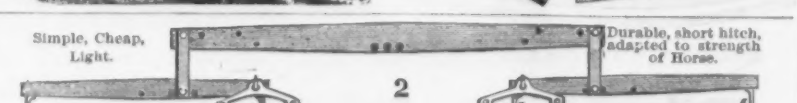
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Fulcrum 1 1/2 inch
in short bit.
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as stump gives
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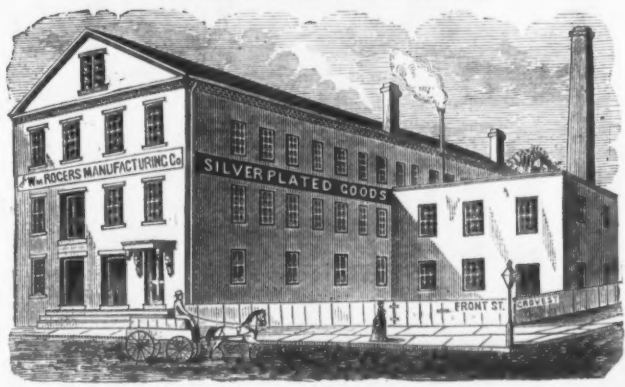
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Pat'd Sept. 23, 1879.

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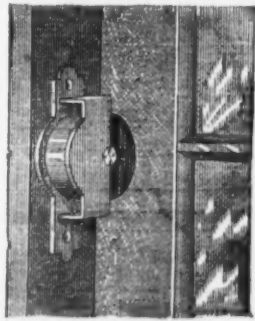
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The Anti-Window Rattler supplies a long needed want; it is so simple in construction that it can be used on any window, and so complete that it will prevent the slightest shaking, no matter how great the jar or how old the sash. As shown in cut, it consists of a rubber wheel in a nickel-plated or brass frame; is ornamental as well as useful, and does not interfere with raising or lowering the sash.

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**SUPERIOR SILVER-PLATED
KNIVES,
FORKS,
SPOONS,
CASTERS,
CAKE BASKETS, &c.**

at the beginning. The water was kept above the second gauge. As much smoke as is usual with boilers set in the ordinary way issued from the stack during the test.

The above experiment shows a saving of a little more than 25 per cent. in favor of Pierce's furnace.

Report of the United States Testing Board on the Properties of Wrought Iron and of Chain Cables.

(Concluded from Iron Age, Sept. 18, 25 and Oct. 2, 1879.)

EFFECT OF THE APPLICATION OF SUDDEN STRAINS TO PORTIONS OF THE VARIOUS BARS WHICH WERE PREVIOUSLY TESTED BY STEADY STRAINS.

The tests of the powers of the various irons to resist steady tensional strains, applied in the direction of the fiber, and when manufactured into links, have furnished us with data by which their relative powers to resist sudden strains, applied transversely, could be judged. As cables are more frequently broken by strains of this nature than by all other causes combined, it was considered necessary that the series should be subjected to such tests as would develop their relative values in this respect before we could express an opinion as to which of the varying characteristics, as developed by tension alone, indicated that the iron in which they existed could be considered as in every way suitable for the manufacture of cables. Having no apparatus by which such tests could be made, one was devised by the chairman of this committee, by the use of which we were enabled to form a very fair judgment as to the comparative values of the irons when subjected to shocks. The apparatus chiefly consisted of a cast iron hammer of about 100 pounds weight, having a wedge-shaped impact surface upon its lower side, and made to traverse two vertical iron rods of about 2½ inches in diameter and from 30 to 50 feet in height. At the foot of the rods was placed a heavy cast iron anvil block with a vertical cylindrical opening 8 inches in diameter. In using the machine, test pieces of at least 12 diameters in length were placed across the hole in the anvil, the centers being directly under the wedge-shaped hammer, which was raised to various heights and allowed to drop upon them. Bars of some irons which were tested by this method could, while in their normal condition, the skin being in no manner nicked or weakened, be broken in two by blows of less than 3000 foot-pounds force; with other irons it was necessary to weaken them by a circular score 1-32 of an inch deep that we might succeed in breaking them, it not being convenient to use a hammer of over 100 lbs. weight, which could be hoisted but 30 feet. The wedge-shaped portion of the hammer permitted a bar to bend to an angle of 120 degrees. Through the data collected by the test by this method of a large number of bars of various irons differing widely in character, we were able to detect the existence of a connecting link, and partially trace its course between the characteristics displayed under tension and those produced by impact.

Iron with high tensile strength generally proved to be possessed of but comparatively low resilience; it would break under the blows with but slight deflection, and leave a fractured surface, smooth as though the bar had been cut in two by a sharp knife, the ends of the fibers showing, like steel, a finely granulous surface. Iron of coarse, slightly granulous character would have an equally smooth and bright surface, but the coarse granulous appearance of the cut fibers denoted how slightly they had been affected by the rolls. Iron with a high elastic limit would resist the first blow with but little injury or deflection, but the deflection once started by subsequent blows, it would yield more at each than would other irons with a lower limit, which were more affected by the first blow. Some irons would, after having been weakened by the circular cut through the skin, resist, with slight injury, blows which would break in two bars of the same size of other irons which had not been so weakened.

There are many irons valuable for many purposes which would not yield good results under this form of test; but, however valuable for other purposes, the material which proves brittle under test cannot be expected, when made into cable and subjected to strains of a similar nature, to prove equal to its tasks.

Iron which is materially weakened by a repetition of slight sudden strains, none of which produce perceptible injury, but which do so injure it that eventually a strain no greater, and perhaps much less than those previously encountered will destroy it, is not suitable for cables. Our tests by impact revealed that large quantities of iron possessing the above defects had been accumulated by the government, all having passed satisfactorily the examinations, which consisted of tension tests made upon test pieces of erroneous proportions. Much of this iron was of good material, but the low price at which it had to be supplied in order that the lowest bidder should, as the law directed, receive the contract, had necessitated that, in order to make it cheap enough, but very little work should be expended upon it. Our experiments demonstrated not only its want of value in its present state, but also that by thorough work it could be vastly improved, and when, in addition to this work, material of no greater cost, but possessing qualities that the coarse chain lacked was added, we found that most valuable iron, capable of resisting all strains, was produced.

An example of such a transformation will be described. The material selected was taken from a pile of 23-16-inch chain iron, and was probably as inferior a bar of iron as could be found in the pile or in our markets, there being in the stock of chain iron, however, a great many equally as poor. These bolts, each over 26 inches long, were thoroughly tested. Several which had not been weakened by a score were broken square in two by a single blow of the hammer, dropped 25 to 30 feet; others, after having been struck from 10 to 20 times by the hammer from a height of 8 or 10 feet, and showing no injury or deflection, would, upon receiving another blow

of no greater force, break in two; other bars scored as has been described would break in two at single blows of from 1 to 3 feet drop. In all cases the appearance of the fracture was the same, and would be described as "bright coarse granulous." The broken fragments of bars of this lot were piled with alternate layers of old boiler iron (they having been first thoroughly reworked) and were hammered into a bloom from which a bar of 2 inches diameter was swaged. This was cut into pieces 24 inches long, and the pieces were scored in two places 8 inches apart, and then tested, as was the original bar, except that each drop of the hammer was from a height of 30 feet. The first score received to such blows before it was entirely torn in two, and the fractured surface appeared fibrous. The extreme difference between the appearance of the fractures made upon the same material (and it of great resisting powers), by different degrees of the same force, indicates that it is unsafe even for an expert to attempt to give evidence as to the character of the material from which a bridge, axle, or cable that has been accidentally broken was made, unless he knows just how it was broken. To render a judgment upon this point a person must not only be an expert, but he must know by what character and amount of force the fracture was produced.

CRYSTALLIZATION.

The question as to whether crystallization can be produced in iron by stress, or by repetition of stress with alternations of rest, or by vibration, has been very much discussed, and very opposite views are entertained by experts. We have met with but one unmistakable instance of crystallization, which was probably produced by alternations of severe stress, sudden strains, recoils, and rest. The connecting rod of the chain-prover was 5 inches in diameter, had been in use for 40 years, and had during this period been frequently subjected to stress up to 250,000 lbs., with recoils produced by rupture of test pieces. It was carefully made in the anchor shop, being hammered from the best quality of wrought iron scrap; it is not probable that any section of it, if broken when first made, would have displayed crystalline structure, but while we were testing, it parted one day at less than 200,000 lbs. stress, and the surface of the fractured ends showed well-defined crystallization, the facets being large and bright as mica. The ends having become injured by rust, the bar was again broken by impact at a point distant over a foot from the first fracture, and the same appearance was found.

EXPERIMENTS ON THE ELEVATION OF THE LIMIT OF STRESS.

The discovery that wrought iron, after having been subjected to a steady stress up to the point of its ultimate strength, would, if then released from stress and permitted to rest, experience an elevation in both its elastic and tensile limit, was made by Prof. Robert H. Thurston in November, 1873, and by the chairman of these committees a short time afterward while carrying on an investigation by tension, Prof. Thurston having made his discovery by torsion tests. The discoveries were entirely independent, neither experimenter having any knowledge of the other's work. As at the beginning of the series of tests incorporated in this report but little data had been obtained as to the operation of this new law, it was thought desirable, while making investigations in regard to chain iron, to utilize at slight expense many of the test pieces in investigating its action. By bringing a piece to the tensile limit all data as to its strength is obtained, and by carrying the test to rupture we gain simply the dimensions after rupture and means to reduce the strength, &c., to those measurements. We therefore released a number of test pieces from stress when the tensile limit was reached, and, preserving them for various periods, eventually broke them, with results as given below.

Twelve test pieces which had been strained to the point of "tensile limit" while testing irons C, D and K, were permitted to rest free from strain for from 24 to 30 hours and then broken, with results as follows:

Number.	Iron.	Strength second day over that of first test.	
		Pounds per sq. in.	Per cent.
1	C, 2 inches.	3,357	6.6
2	C, 1½ "	2,238	4.4
3	C, 1½ "	2,506	15.1
4	C, 1½ "	2,550	17.0
5	D, 2 "	952	2.0
6	D, 1½ "	7,354	15.7
7	D, 1½ "	7,771	16.1
8	D, 1½ "	6,825	16.7
9	D, 1½ "	6,904	14.1
10	D, 1½ "	8,325	16.3
11	K, 1½ "	4,203	8.2
12	K, 1½ "	5,040	9.8

The indications were that an iron of a fine fibrous type gained the largest amount by the rest.

A second experiment was made with 42 test pieces of iron F, which was of remarkably uniform structure. After having been strained to tensile limit, the pieces were allowed to rest for periods varying from one minute to six months, when they were re-tested, with results of which the following is an abstract:

Average gain in less than 1 hour.	Per cent.	Tests.
8 and over	1.1	5
1 hour.	3.8	8
Average gain in 3 days.	16.2	10
" 8 "	17.5	2
" over 8 and less than 43 days.	15.3	5
Average gain in 6 months.	17.9	12
Total.	42	

The first series of experiments (Nos. 1 to 12) gave indications that the operation of the law was less felt by coarse and brittle irons and by those of a steely structure, than by those of a more fibrous, ductile texture. This was considered to be a point worthy of careful examination, and a series of comparative experiments was made upon test pieces composed of the three varieties of iron. Thirteen pieces were prepared, five of which were of soft charcoal bloom boiler iron, five of coarse contract chain iron, and three of a fine-grained bar of iron,

WESTON DYNAMO-ELECTRIC MACHINE NICKEL.

The rapid increase in the use of Nickel-Plating owing to the introduction of the Weston Machine and the very low price of nickel material, enables us to give greatly reduced estimates for complete outfits.

We are furnishing outfits specially adapted for Stove Work, giving a pure white deposit on plain or mat surfaces.

CONDIT. HANSON & VAN WINKLE
Sole Agents
NEWARK, N.J. U.S.A.
ENGLISH AGENCY: 18 Caroline Street, Birmingham.

**ALWAYS ASK FOR
ESTERBROOK'S
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THE MOST POPULAR PENS IN USE.
For Sale by all Stationers.
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Near First, **BROOKLYN, E. D.**

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Hardware & Metal Broker,
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Representing in the Dominion of Canada several American Manufacturers, is ready to accept further Agencies. Satisfactory references.

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Manufacturers of
Brass, Gilding Metal, Copper and German Silver
(In Sheets, Rods, Tubing or Wire).
COPPER & BRASS RIVETS AND BURS.
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PHOSPHOR-BRONZE
Bearings,
Pump Rods and
Spring Wire.
Apply to
The Phosphor-Bronze Smelting Co., Limited,
203 Washington Avenue, Philadelphia.

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Manufacturers of the

BEST QUALITY CARRIAGE MAKERS' HARDWARE.

Manufacture the Largest Variety of Forged Carriage Irons of Best Material and Workmanship.

PRICES LOW FOR QUALITY OF WORK FURNISHED.

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Polished or Blued Horse Nails, Hammered and Finished.

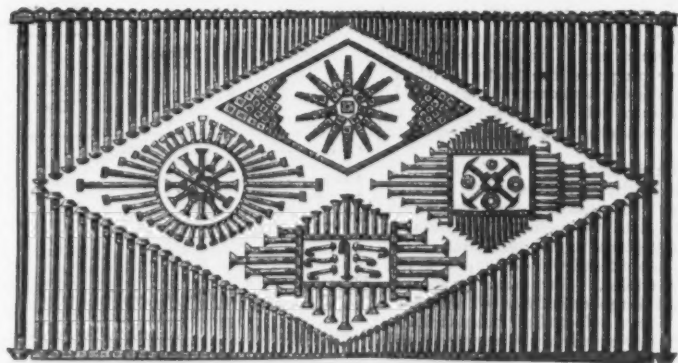
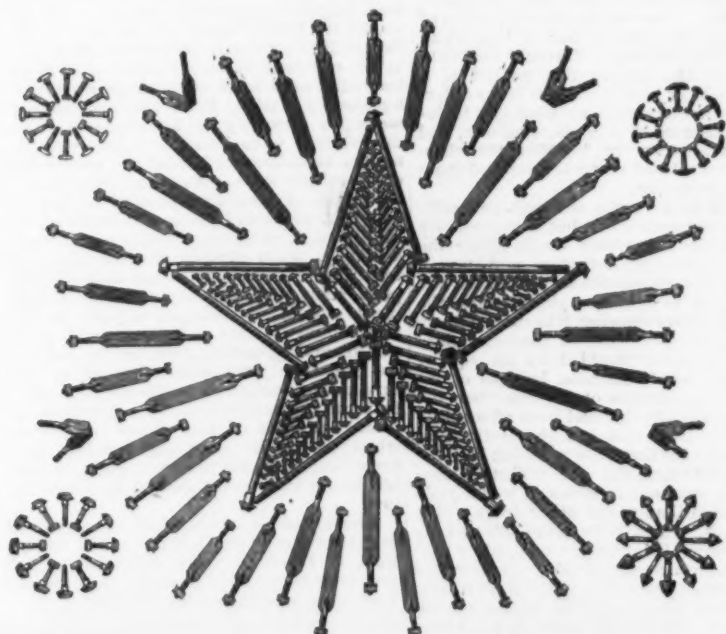
The Saranac Nails are hammered hot and the finishing and pointing are done cold. Quality is fully guaranteed. For sale by all leading iron and hardware houses.

S. P. BOWEN, President and Treasurer.

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Manufacturers of Hexagon Head Cap Screws, Round Head Set and Cap Screws, Square Head Set and Cap Screws, Machine Screws, Hobbins, Gun Screws, Agraffes, Studs, And other articles turned from Steel, Iron or Brass by automatic machine.

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Patented April 30th, 1878.
Re-issued July 8th, 1879.

The Kidder

THE
Improved Barn Door
Hanger,

With Wood Track. It does away with the iron rail, and cannot be thrown off the track, having a flat-faced wheel one inch wide. It runs as easily with less noise and can be put up in less time than any other Hanger made. Track made solid or of two pieces. For sale by the wholesale trade generally, and the

KIDDER SLIDE DOOR HANGER CO.,
Sole Manufacturers. ROMEO, MICH.

HALL'S PATENT
DOUBLE COMPOUND LEVER CUTTING NIPPERS.
NEAT, HANDY, POWERFUL AND DURABLE.

Of the many Cutting Nippers heretofore placed on the market, not one has supplied either of the two great needs long felt by all who use them, viz.: 1st. Increased power without a clumsy and expensive increase of size. 2d. That the construction of the Nipper should be such that any damage to the cutting jaw or handle, from wear or accident, could be repaired.

The HALL NIPPER meets these requirements fully, being constructed as shown in the cut, and made perfectly interchangeable in all its parts; a jaw, handle, or any other part, can be readily removed, and replaced without trouble at a very trifling cost.

These Nippers are made entirely of the very finest quality of steel, made expressly for them, the different parts being drop-forged by the Cold's Fire Arms Co., of Hartford, Conn., which is a sufficient guarantee of the excellence of the work.

This Nipper gives greater cutting power than any Nipper ever made. The accidental fracture of any part does not render the tool worthless, as it can be obtained at the cost of a few cents, and replaced without trouble, every part being perfectly interchangeable. Every pair warranted.

Manufactured by THE INTERCHANGEABLE TOOL COMPANY, of New York.
Manufacturers of Special Tools and Machines on the Interchangeable System.

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WITH
Steel Converted Toe Calk.
FIVE SIZES.

A perfect, finished Shoe, ready to apply without fitting.
WILL OUTWEAR ANY OTHER SHOE MADE.
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MANUFACTURERS OF
Superior Malleable Iron

SHARP CALK. STUB CALK.

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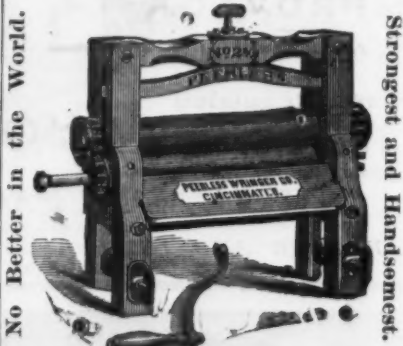
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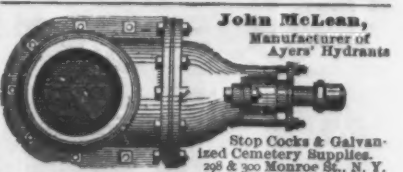
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TRY A SAMPLE ORDER.

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ESTABLISHED 1859.

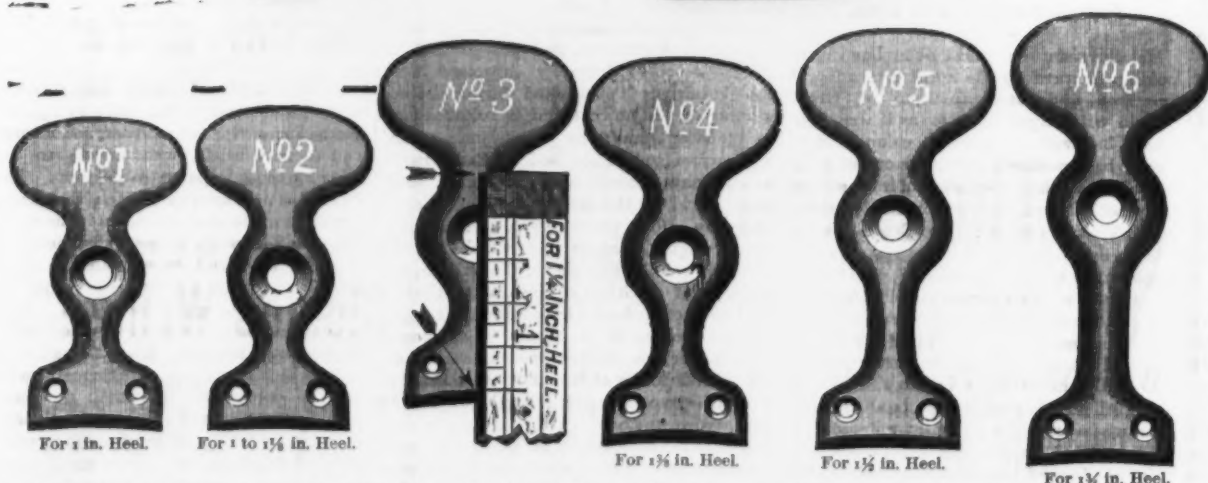
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LAMBERTVILLE IRON WORKS,
LAMBERTVILLE, N. J. Send for prices.



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VENTILATORS
MANUFACTURED BY
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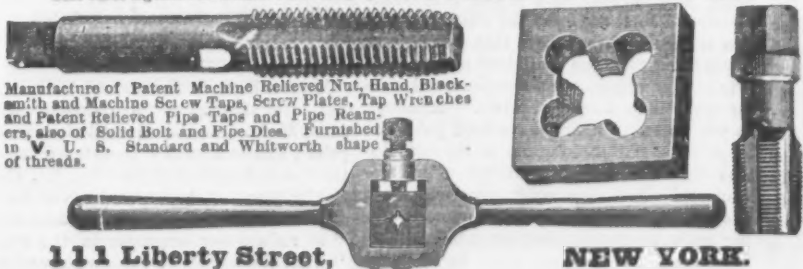
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Hawsing Beetles, Hawsing and Calking Irons : also all kinds of Handles, Sledge, Chisel and Hammer Handles. Also
COTTON AND BALE HOOKS,
 Patented Feb. 13, 1877; a new combination of Hooks.
456 E. Houston St., New York City.

Order of Values,	Tensile strength,		Reduct'n of area.		Elonga- tion.		Proportion of strain due to that of bar,	
	Iron.	Lbs. per sq. in.	Iron.	Per cent.	Iron.	Per cent.	Iron.	Per cent.
1.....	L	66,598	O	54.2	Px	29.9	B	168.2
2.....	D ₁	56,670	O	49.0	P ₁	27.7	B	168.1
1.....	D ₂	56,563	P	48.0	O	27.3	O	165.7
1.....	P	56,061	P	48.1	O	27.7	O	163.9
9.....	D ₁	55,938	P	48.0	O	27.3	O	163.9
6.....	P	47,775	P	46.7	Fx ₂	26.0	Fx ₁	157.5
7.....	N	54,380	Fx ₁	45.8	F ₁	21.6	F ₂	157.5
8.....	Fx ₁	54,774	Fx ₂	45.6	Fx ₁	21.6	F ₂	156.0
9.....	F ₁	55,028	M	45.3	O	21.6	O	154.5
10.....	D ₁	53,902	O	45.2	D ₂	20.0	F ₂	154.5
11.....	F ₂	53,107	D ₂	43.8	N	20.2	Fx ₁	153.4
12.....	B	55,764	O	40.6	D ₁	18.2	M	150.7
13.....	F ₂	52,759	C ₁	38.4	C ₂	18.9	K	141.6
14.....	C ₁	52,759	C ₂	38.4	K	17.9	O	141.6
15.....	F ₂	52,471	K	38.0	B	17.2		
16.....	J	51,754	N	35.0	C ₁	15.4		
17.....	C ₁	51,451	J	33.0	E ₁	15.3		
18.....	O	51,734	J	30.4	J	12.6		
19.....	P	52,765	N	25.9	L	8.3		

SUMMARY OF THE PANTALIN PATTERN					
CON.	L.	K.	D ₂	C ₂	
1. Form 2. Color 3. Consistency 4. Shape	1	2	3	4	
	15	5	11	11	
	16	13	9	12	
	17	14	10	8	
	14	12	6	5	
percent.	0.072	0.152	0.203	0.156	
	0.091	0.087	0.147	0.154	
	0.100	0.086	0.092	0.082	
	0.120	0.081	0.085	0.081	
	0.064	0.019	0.085	0.086	
..	0.114	0.087	0.087	0.078	
	0.051	0.053	0.076	0.076	
	0.051	0.053	0.076	0.076	
	0.051	0.053	0.076	0.076	
	0.051	0.053	0.076	0.076	

	M	P	N	Fe
5	6	7	8	
10	6	14	7	
6	10	10	18	
11	9	13	3	
0.255	0.150	0.193	0.16	
0.184	0.132	0.119	0.15	
0.144	0.081	0.075	0.07	
0.030	0.031	0.035	0.03	
0.070	0.037	0.029	0.029	
0.132	0.057	0.073	0.05	
1.044	0.448	1.710		

	Fe	D ₁	Fe ₂	B	A	J	F	O
1	0	10	11	12	13	14	15	16
2	0	5	7	11	4	15	6	3
3	1	11	5	14	8	16	5	3
4	4	6	2	1	2	14	4	2
5	0	0	1	0	1		5	2
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47	0	0	0	0	0		4	2
48	0	0	0	0	0		4	2
49	0	0	0	0	0		4	2
50	0	0	0	0	0		4	2
51	0	0	0	0	0		4	2
52	0	0	0	0	0		4	2
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57	0	0	0	0	0		4	2
58	0	0	0	0	0		4	2
59	0	0	0	0	0		4	2
60	0	0	0	0	0		4	2
61	0	0	0	0	0		4	2
62	0	0	0	0	0		4	2
63	0	0	0	0	0		4	2
64	0	0	0	0	0		4	2
65	0	0	0	0	0		4	2
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67	0	0	0	0	0		4	2
68	0	0	0	0	0		4	

The *Bulletin* of the American Iron and Steel Association says: "The extraordinary and wholly unexpected demand for steel rails for prompt delivery is to be met in part by a novel expedient. An experimental importation of 10 tons of Bessemer steel blooms has been made by a Philadelphia house for an iron rolling mill in Eastern Pennsylvania. It is the intention to roll these blooms into rails, and it is supposed that rails thus manufactured will be as eagerly sought after as those made from American blooms. The small importation was made not to test the capacity of our iron rolling mills to satisfactorily manipulate the blooms, but to make a case for the Treasury officials which would settle the question of duty, and thus demonstrate the practicability of rolling steel rails here from English blooms at a profit. Judge French, assistant secretary of the Treasury, has decided that the blooms are subject to a duty of 45 per cent. *ad valorem*, as manufactures of steel not otherwise provided for, and this duty will permit of their importation at a profit. We expect to hear of considerable importations being made before winter."

There are three manufactories in this country where fine plate glass is manufactured: one at Lenox, Mass.; one at New Albany, Ind., and another at Crystal City, Missouri.

The Iron Age

AND
Metallurgical Review.

New York, Thursday, October 9, 1879.

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If the people of France knew how little interest the people of this country take in the proposed Franco-American treaty of commerce, they would probably drop its discussion for the present. We learn by telegraph that on the 5th inst. a large meeting was held on the Champs-Élysées to advocate such a treaty. A resolution was adopted inviting President Grévy to appoint three commissioners to study the situation, to report to the proper ministers and, if necessary, to co-operate with any commissioners who may be nominated by the United States. Fernando Wood, M. C., and Messrs. Frederic Passy and Leon Chotteau addressed the meeting. Mr. Wood said he spoke only as a private citizen of the United States. He declared the present relations between France and the United States not what they ought to be, and that their mutual interests suffered considerably in consequence. The only remedy was the conclusion of a treaty. It would be necessary to lower the tariffs for that purpose, and public opinion must exercise an irresistible pressure on the two governments. Mr. Wood

finds this kind of talk more popular in France than at home; but perhaps he could have given his audience some valuable instruction if he had told them the story of his attempt two years ago to fix the tariff in the interest of foreign manufacturers, what a mess he made of it, and how his effort was regarded by the people of the United States. M. Chotteau might have told them with profit that, while he was politely treated in this country, he failed to make any impression upon the public mind, and that the interest felt in the proposed treaty is, like its expected benefits—all on the side of France.

The Wages of Labor.

One of the most satisfactory evidences of the substantial improvement in business, may be found in the prompt and liberal response which capital has made to the demands of labor. The labor question is always a difficult one to deal with, and is especially so at the present time. The advance in manufactured goods during the past six months has been remarkable, averaging probably from 25 to 50 per cent. in all kinds of iron products. This is a very substantial and gratifying condition of affairs, and at first sight it may seem as though the workman should participate to the full extent of the increase in the value of the products of which labor forms an important item. A careful investigation of the subject, however, will considerably modify opinions of that kind. We could cite numerous illustrations to show that labor is already not only receiving a full share of the benefits arising from an improving condition of business, but that it has to some extent discounted the future. We know of many large concerns which made contracts six months or a year ago at prices which barely paid expenses. This was done to keep the works running and find employment for their men. At the time these contracts were taken the men congratulated themselves that, although times were bad and thousands were out of work, they, at any rate, were sure of steady employment. When business began to improve, wages were advanced. In many cases every dollar of this advance has been so much dead loss on contracts such as we have mentioned. We know of an instance in which a large order was taken about six months ago at a price which was then considered quite satisfactory. That contract is still under way, although the cost of production has been very materially increased beyond the original estimate, so that the finished work is being delivered at an actual loss, while the raw material will have to be replaced at an advance of from \$12 to \$14 per ton. In point of fact, the raw material is now being delivered at \$2 to \$3 per ton more than the company are receiving for the finished product under old contracts.

The labor question should also be considered in reference to its influence on business in the future. If there was a reasonable certainty that values would be maintained, labor in some departments might properly claim a further advance; but a second or third advance, as some are demanding, would certainly be premature and dangerous. The interests of the country will be best served by a moderate range of prices, and too rapid an advance will possibly lead to a serious reaction. There is already danger to the iron interest in the heavy importations from abroad, and the higher prices go the more certain it is that importations will increase until our markets are overloaded with goods, to be followed by the results which naturally attend a sharp competition among holders desirous of realizing. The condition of the working classes in other countries must also have an important influence on our labor market, and it may be regarded as certain that values cannot be safely pushed any further until there is a corresponding movement in Europe.

We do not expect the working classes to reason deeply or logically in matters of this kind, but those who shape their opinions and lead their action should counsel moderation. The outlook is brighter for the workmen to-day than it has been in many years. Measuring his wages by its exchange value or purchasing power, he is far better off now than he was before the panic, when the country was experiencing all the fictitious and precarious benefits of inflation. The present basis of values makes a day's work far more productive now than then in securing for the workman the comforts and gratifications for which he exchanges his earnings. His share of the profits gained by the co-operation of capital and labor is, therefore, increased, and this fact should be taken into consideration. It is also well to remember that fluctuations in the rate of wages are the result of causes which find their origin in the operation of natural laws. Advances may be hastened or reductions retarded by the agency of strikes or organized movements, but such variations are temporary. The long period of depression through which we have passed has shown thinking men among the working classes that trade unions, however strong or well organized, can no more resist the operation of natural laws than human agency could slay the wind or repel the rain. The same is true in times of prosperity. When the point is reached at which the power of capital to pay wages is exhausted, production ceases, labor is thrown out of employment and the competition of workmen with each other results in reductions. It is com-

petition, after all, which determines the value of labor. Just now the demand for labor leads to competition among employers to secure skilled mechanics, and the result of this competition is seen in the better wages offered. If there should be a reaction from any cause, coupled with a partial suspension of manufacturing, the competition of the workmen to secure employment would cause wages to drop rapidly and inevitably. These are facts which show the wisdom of moderation at all times in the councils of the labor unions. But there are other and good reasons why such moderation is just now very desirable. As we have shown, the increase in the cost of manufacturing has thus far, in many cases, been more than proportionate to the increase in selling prices, and in but few instances are the profits to manufacturers of iron or iron goods in proportion to the volume of their business. But the fact that prices have advanced to a line which enables the products of cheaper labor in other countries to float over our tariff and into our markets, has revived the hopes of importers and quickened the activities of those interested in seeing our markets thrown open to unrestricted foreign competition. A year ago it seemed impossible that the United States would ever again become importers of iron to any considerable extent, but now it would be difficult to learn the actual magnitude of the transactions concluded or in progress looking to such importation. There can be no doubt that some effort will be made during the next two sessions of Congress to break down the wall which stands between our industries and the flood of foreign manufactures ready to overwhelm them. The uncertainty which, it must be confessed, attends the future of tariff legislation, is a perpetual menace to the interests of labor, and the working classes cannot afford to force a too rapid advance in prices, nor to alienate the sympathies of other classes of the community by unreasonable demands. Better anything than this. The working classes have in the present tariff some guarantee of fair prices for their labor, but if our markets should be in any degree thrown open to the cheaper labor of Europe, those who are now clamoring for advance after advance would be the first to suffer sharp and permanent reduction. It will be well, therefore, to make haste slowly, and secure a permanent, steady market in preference to a short period of unhealthy activity, to be followed by protracted depression.

The Iron and Steel Institute and the Dephosphorization of Iron.

Metallurgists the world over have been looking forward to the autumn meeting of the Iron and Steel Institute of Great Britain with eager interest, as it was generally believed that much valuable data would be presented on the important question of the dephosphorization of iron, and on the practical results of continuous working of the Thomas process. The English papers which have just been received, notably *Engineering* and the *Ironmonger*, give full reports, from which we take the following summary of the papers and discussion on the all-absorbing metallurgical topic of the day, as we find it impossible, in view of the crowded state of our columns, to begin our usual full abstract of the proceedings until a future issue. The direct contributions in the shape of papers are, from a practical point of view, of less value than was anticipated, but the discussion which followed the reading of one paper seems to have called out some important statements bearing upon practical questions. This occasion was offered by a communication on the "Dephosphorization of Iron and Steel," by M. A. Pourcel, of Terrenoire, whose criticism of the Thomas-Gilchrist process has evoked so much comment on both sides of the Atlantic. Although, in common with all the papers submitted by foreigners to the Institute, it has suffered unduly in the translation, it is by no means as clear and forcible a statement of the views of the eminent Frenchman as usually comes from his pen. It is original and full of interesting data, but, to English readers, will appear to lack the order and strict sequence of a scientific paper. M. Pourcel, in presenting the question of the introduction of phosphorus into iron and steel or of eliminating it, urges that three elements chiefly govern the behavior of phosphorus in the different metallurgical operations. These three, which vary considerably in importance, are: the chemical composition of the cinder, the temperature, and the nature of the atmosphere in which the reactions take place (whether reducing or oxidizing). In the blast furnace it is the temperature which exercises a predominating influence, not the chemical composition of the slag, which is often highly siliceous without being therefore charged with a greater amount of phosphoric acid. M. Pourcel has found, in producing high grade ferromanganese in the blast furnace, that manganese in the cinder has not, as Dr. Percy assumes, the property of retaining phosphorus, and he believes, therefore, that in the blast furnace, where the third element, a reducing temperature, is constant, the first, the nature of the cinder, is of little importance, while the influence of temperature predominates. To this view strong exception was taken, notably by Mr. Snelus, who pointed out that a very close relation exists between the reducing action of the gases in good or bad working and the contents of phosphorus in

the pig. M. Pourcel then passes to a review of several direct processes—that in the Catalan forge, the Siemens rotator, and the DuPuy method. In these also the chemical composition of the cinder is not important, while the action of the reducing atmosphere varies with the temperature, so that a low heat is requisite to produce metal free from phosphorus. In stating that the losses, cost of fuel, labor, &c., in the DuPuy process have not yet been determined, M. Pourcel has failed to keep abreast of current progress, as the data to which he refers have been quite fully published through the *Journal of the Franklin Institute* and *The Iron Age*, and the articles in question were freely copied by Continental technical journals.

In puddling, a direct influence upon dephosphorization is assigned to the chemical composition of the cinder, the action of the flame being oxidizing, while the temperature acts in direct proportion to its intensity. Manganese is held to possess a favorable influence upon the removal of phosphorus, less because of any chemical action than by reason of the great fluidity of the cinder charged with manganese. Passing to the Bell and Krupp refining processes, M. Pourcel doubts whether the high price of manganiferous ore used in the latter process compensates for the greater rapidity with which the purification is effected, and for the protection which a more fluid manganiferous slag would afford against the oxidizing action of the flame. He considers the advantages secured by the use of manganiferous cleaning ore too dearly purchased. It may be of interest in this connection to draw attention to Mr. A. L. Holley's paper which we print elsewhere, and from which it will be seen—for instance, in the case of the Luxembourg pig, Table III—that cleaning ore free from manganese has been successfully tried at Essen. In this, as well as in the Thomas process, M. Pourcel considers the action of silicon all-important, and he suggests that a good means of proving experimentally the truth of his hypothesis on the phases through which the phosphorus passes in a lime-lined converter, would be to blow pig containing a high proportion of silicon to phosphorus, with an addition of 20 per cent. of a mixture of three of blue billy (oxide of iron) and one of lime. To this both Mr. Richards and Mr. Snelus took exception, as the result would be a violent ebullition which would throw one-half of the metal out of the converter. Both carbon and silicon would be too rapidly eliminated, and the charge would become pasty. Mr. Richards stated that a series of analyses made of samples taken at intervals of three minutes during a blow, had proved that M. Pourcel's theory formerly expressed, that the phosphorus is eliminated during the beginning of the process and is reintroduced by the later generation of carbonic oxide, was erroneous. They had at Essen made experiments to avoid the reduction of phosphoric acid by the introduction of spiegel-eisen, by adding previously a certain quantity of highly siliceous iron, which had the effect of quietly disposing of the oxygen, the presence of which had hitherto caused the violent commotion during the addition of spiegel. A later attempt to make a compound of siliceous iron and ferromanganese, in order to reduce the additions to one instead of two, had been only partially successful. An interesting change which was made consisted in the blowing in of powdered lime, the method, it will be seen, which was quite recently patented in this country by Mr. Reese, of Pittsburgh. The results, it would seem, have been very satisfactory, one-half of one per cent. of phosphorus being taken out, while two per cent. of carbon remained in the metal. The chief object was to prevent the wearing of bottom, and the only difficulty met with was a gathering of material at the nose of the converter during the afterblow. Mr. Richards stated that oxide of iron was now dispensed with, while Mr. Thomas added that blows had been successfully made with pig running as low as one per cent. of silicon. Thus the limits within which it was thought the process was available have been very greatly extended, many having hitherto held that the generation of the heat necessary to fuse both the steel and the additions, would require much larger quantities of the element the combustion of which is the chief source of heat. The brief account by Messrs. Richards, Snelus and Thomas, of what was doing at Bolckow, Vaughan & Co.'s works at Eston, shows an intelligent and persevering activity on the part of the promoters of the new dephosphorizing method which seems even now to have borne fruit. Every weak point appears to have been given full consideration, and the means adopted to remove the causes of inconvenience or the sources of additional expense, have been wisely chosen and practically carried out in a way which must challenge admiration. A few months since many metallurgists had grave and well-founded doubts, not as to the chemical success of the new process, for that was beyond dispute, but as to the possibility of carrying it to a successful issue on a commercial scale for more than a few localities. Although as yet no exact figures have been published to prove the satisfaction of the incredulous that the Thomas process offers advantages above the older practice when adopted on a large and continuous working scale, we believe that the removal, one by one, of the main obstacles to its introduction is a sufficient warrant for the

opinion that it is now, or in the very near future, destined to displace the present method of converting pure pig.

In this connection it may be of interest to refer to the results obtained by the Northeastern Railway with rails made from Cleveland pig at Eston, as communicated to the meeting by Mr. I. Lowthian Bell. The average percentage of the first lot obtained was 0.1 per cent. of phosphorus and 0.3 per cent. of carbon, which was made low, in accordance with the experience first gained at Terrenoire, that carbon must be decreased as phosphorus is increased. The rails resisted the impact of a one-ton drop, falling 10, 15, 20 and 27 feet successively, while the ordinary test called only for a height of 5 feet. Mr. Bell added that it might be regarded as fairly proved that steel rails of good trustworthy quality can now be produced from Cleveland pig.

M. Pourcel's paper, which was valuable even if it did no more than to call out the important statements to which we have referred, concluded with a reference to the pig and ore process which brought out some points to which we will return later on. There were also introduced to the notice of the metallurgical world two new methods designed as improvements of the manufacture of Bessemer steel, which will be duly presented to the readers of *The Iron Age* in forthcoming issues. Numerous communications were contributed to the Liverpool meeting which will make it rank fully equal in importance to the previous gatherings of the Institute.

Belgian Enterprise.

Among the nations of Europe there is none, probably, which in late years has shown so much enterprise and discretion in seeking an outlet for its manufactures in foreign countries as Belgium. Surrounded by large and powerful neighbors who command vast resources, the little kingdom has struggled bravely and intelligently for a share in the business which the non-manufacturing countries have turned over to European workshops. The demands of a limited home market do not suffice to keep a large working population employed, and extensive plant of furnaces and machinery in operation constantly enough to render manufacturing profitable, while competition in foreign markets can only be faced by the strictest economy of working and marketing. Belgian workmen are frugal and industrious, and Belgian manufacturers and merchants vigilant and enterprising. They claim and have obtained the most earnest and intelligent co-operation on the part of their government, which leaves nothing undone to promote the industrial and commercial interests of the country. While the relations between the government and the industries of Belgium may appear to Americans altogether too paternal, it may be well to note briefly what efforts are being made by those in power in Belgium. There is perhaps no country in which the consular service is made to serve the interests of commerce and industry better, and in none is the work of its members as valuable and as suggestive. The government is not content, however, with issuing a circular recommending or ordering the preparation of occasional reports. Recognizing the difficulty which men must experience who have had no opportunity to watch the rapidly changing currents of enterprise in their own country, by reason of long absence and restricted relations, the government does all in its power to keep them correctly informed as to the aspect of industrial affairs at home. One of the means by which representatives in foreign countries are afforded an opportunity of obtaining a correct idea of what is wanted at home, is a compilation of the reports of Belgian industrial and commercial associations which is distributed among them. The machinery is cumbersome, it is true, but it must prove a valuable auxiliary to the trade press, which closely reflects the weekly variations, at a sacrifice often of broader and more general views of the course of affairs. As another instance of the enterprise shown, we may be permitted to refer to a project detailed by the King of Belgium to the reporter of a large German newspaper. With a view to assist individual enterprise in opening new markets for machinery, iron, steel, &c., in China and Japan, engineers have been detailed to the respective embassies as attachés, their duties being to keep the government informed on all subjects likely to prove of value to the trades whose wants and capacity for supplying manufactured articles they know. The king proposes to extend this system, and to call upon each province to assist in educating twelve young men and sending them to foreign countries with liberal traveling allowances. This would, therefore, virtually amount to a proposition to organize on joint account a corps of well-trained travelers who would do all within their power to detect, follow out and examine new and promising opportunities for trade, a system which, if it does not call for imitation, certainly challenges admiration.

Messrs. P. & T. Collins, of Philadelphia, deny that they have "abandoned" the ill-fated Madeira and Mazore Railroad enterprise; and in a rather ill-natured letter to the *North American* of that city, Mr. Thomas Collins says: "As we have never received a dollar on our contract, it was necessary to reduce our expenses to the smallest amount possible, and this we have done by 'bringing home our men with the excep-

"tion of 15, who were left in the charge of the competent foremen to take care of the property." The English stockholders seem to have treated the contractors very shabbily in this matter.

Philadelphia is about to venture a wholesale experiment in elevated railroads, if reports from that city are trustworthy. The *Sunday Times* says: "We heard it asserted yesterday, by those who professed to know, that since the passage of the Filbert street elevated railroad ordinance by Select Council on Thursday, plans are in course of preparation by interested parties for upward of 50 miles of elevated railroads in other streets of Philadelphia, which certain speculators expect to seize upon, or get from Councils the grant of the right of way, which will enable them to pre-empt the principal business thoroughfares of our city for elevated railroads." The *North American* says on this subject that it is evidently the intention of the Pennsylvania Railroad to construct and put in operation the Filbert street elevated railroad as soon as possible, and that the contract for the ironwork has already been given out. This includes the iron superstructure of the bridge which is to be thrown across the Schuylkill River, and every pound of iron which will enter into the construction of the elevated railroad proper. The contract has been awarded to the Edgemoor Iron Works, and calls for about 5,500,000 pounds of iron at a cost of about \$300,000. The time for the deliveries is not specified, but the work will begin immediately.

The prospects of trade are evidently improving in England, and prices are advancing with sufficient rapidity to warrant the belief that large importations of iron and steel will not long be possible. The *Economist* of this week says: "There has been a further sharp advance in prices in the iron trade. Scotch pig is 4/6 and Cleveland 6/ per ton higher on the week, both principally on American orders. The stocks in and around Middlesbrough are, however, still measured by hundreds of thousands of tons. The upward movement is too feverish, and a relapse may be anticipated." It will be remembered that similar fears of reaction were entertained in this country when the improvement began with an advance in prices. If the revival should correspond with that which has taken place in this country, the "hundreds of thousands of tons" will not last long. We have no doubt that the effect of activity in this country will be felt favorably in Europe, and especially in Great Britain, and that while the amount of iron and other merchandise needed by the United States is not likely to have any important influence in reducing stocks, the fact that any demand exists will probably have the effect of quickening the sluggish pulses of trade and stimulating activities in other directions.

If experts have disagreed as to the origin of petroleum, we cannot wonder that those who speculate without knowledge should disagree. We mentioned in a recent issue that an anxious gentleman in Western Pennsylvania was circulating a petition to be presented to the Legislature, asking that further pumping of petroleum be prohibited, because the oil was needed to lubricate the earth's axis. As opposed to this theory, which attributes petroleum to the creative art of a beneficent Providence for a wise and desirable purpose, we hear that the Russian priests are teaching the farmers that after Satan had rebelled against heaven, and was vanquished by the heavenly host, he was imprisoned beneath the mountain range of Caucasus, and condemned to rot there. The result of this decomposition of the devil is—petroleum, which, therefore, is an infernal fluid, as is evident from its nauseous odor and dangerously inflammable qualities. We do not presume that this hypothesis is susceptible of proof, but there are many who might be inclined to believe it in this country. Remembering how much money was staked and lost on delusive promises of large and continuous profit in the days when oil speculation was fashionable, it would not be difficult for the imaginative to trace some subtle relation between B S and Beelzebub, nor to detect the literary style of the Father of Lies by ear marks in the prospectuses of certain oil companies. They might even conclude that Satan is actively interested in the management of the Standard Oil Company, if they should happen to be identified with competing interests.

The steamer Lord Clive, which arrived in port last Thursday, brought a party of riveters who had been engaged on the other side. There is said to be a demand for this kind of labor just now, on account of the large orders for locomotives and the increased activity in shipbuilding, boiler making, oil tanks, &c. The men are to be paid \$2.12 per day. Within a fortnight there have arrived considerable numbers of machinists and boiler makers seeking employment, and it is said that many more are coming. In our judgment, this kind of voluntary immigration is altogether more desirable than the importation of workmen under contract. The men who come here seeking employment have less conceit and fewer "airs" than those specially imported. The latter are rarely content with a contract which binds them to the repayment of their passage money, and are almost always dis-

satisfied with the fulfillment of the promises made them.

The death is announced of General Francis L. Vinton, a prominent mining engineer who has done much in late years in bringing into notice the mineral resources of Colorado, and notably of Leadville, where he died on the 6th instant, at the age of 47 years. He entered West Point as a cadet in 1851, graduated in 1856, but resigning his commission commenced his studies as a mining engineer at the Ecole des Mines, Paris, graduating in 1860. He entered the army at the outbreak of the war, and continued in active service until he was severely wounded at Fredericksburg. He then devoted himself to his profession as mining engineer, and from 1864 to 1877 was Professor of Mining Engineering at the Columbia School of Mines. He resigned his professorship two years ago, and going to Colorado rapidly gained a wide reputation as an expert.

The Cincinnati Exposition has proven a grand success. Up to Saturday evening, October 4, the aggregate number of visitors was 313,595. Every department is crowded daily from 9 a. m. to 10 p. m. The exhibits are the finest and most elaborate that the West has ever boasted of, and it has been said that the exposition at Cincinnati this year is the finest ever known in the United States, excepting the Centennial. All the railroads leading to Cincinnati are doing a very heavy business in the transportation of passengers to and from the city.

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)

LONDON, ENG., Sept. 22, 1879.
THE TIDE OF PROSPERITY

appears to be at length rising, although its primary effects are very diverse and curious in their incidence. It is, nevertheless, no beyond question that a change for the better is being felt, especially as regards those branches which are generically considered to belong to the iron trade proper, as distinguished from the hardware industries and the more advanced miscellaneous branches of the business. The most singular and striking part of the changed state of affairs appears to me to be the circumstance that the bulk of the orders, to which the increased activity is owing, emanate from the United States—a market which had for some time been, by common consent, regarded as being next to entirely lost to the manufacturers of Great Britain. The home trade of this country is almost quite as dull as it has ever been at any previous period of our history, and the exceedingly unsatisfactory harvests, which heighten the prevailing agricultural distress, renders any change most unlikely. It is thus pretty clear that the unexpected and unprecedented activity on your side is having the effect not only of furnishing us with commissions for goods needed by yourselves, but is benefiting us in other ways by minimizing your competition here and in the various external neutral markets where the manufactures of the two nations have latterly been vigorously pushed in vehement opposition to each other. With abundant occupation at home, attended by all the many advantages of supplying the requirements of your own people, and free from the long credits and many uncertainties of foreign indents, it is seen that your manufacturers will, for a time, relinquish their exporting exertions and concentrate their energies in developing more remunerative business. In this manner, if in no other, we seem certain to reap sundry advantages and to receive colonial, &c., commissions which will do much to encourage the renewed activity that is now in its incipient and initial stages. We have also other points in our favor in the shape of the French and Belgian markets, from both of which we have reports of a cheerful and buoyant nature. In some of the leading iron centers of France the principal works are said to be quite busy, and in Belgium the producers of nail rods are well sold forward, so much so indeed that many of them are refusing indents even when offered at 2/6 @ 5/ per ton above the rates recently quoted. The difference between our prices and those of the Belgians is not considerable, so that any rise there will place their wares out of competition and leave us masters of the field. Taken altogether, therefore, the situation appears to possess many elements of encouragement and hope. It would probably be idle and presumptuous on our part to expect any parallel to the extraordinary briskness of your market, but it will not, perhaps, be erring far to permit our expectations to be sufficiently sanguine to look for a fair and steady turnover between this and the end of the year. The one great fear expressed here is that the American "spurt" may prove ephemeral—a mere "flash in the pan," which will do more harm than good, and raise expectations destined to be rudely blasted. So far, however, we have no tidings which would appear to encourage this idea, while, on the other hand, there are abundant particulars in confirmation of the statement that the change is bona fide—real, solid and substantial. There is, consequently, a decreasing minority of fearful ones, and with another week's strong budget from your side I think we may venture to prophesy their absolute non-existence. Those who count themselves among the optimists certainly have capital evidence in support of their case from many of the British iron and hardware centers. The smelters in every section of the country are doing much more business and are turning over larger quantities of pig iron than had been sold for two or three years past. Scotland is sending you heavy consignments, and the brands of her best makers have gone up in price, while at Glasgow the speculation in warrants is enormous and attended with remarkable excitement. In the great Cleveland center,

which produces more pig than any one other district in the whole world, makers are not only declining to "commit themselves" by entering into forward contracts, but have, in many instances, positively advanced selling rates to the extent of 2/6 to 3/ per ton. They, too, are participating in your "rush," and are reported to have sold over 25,000 tons of pig for prompt delivery into your Eastern ports. The other large ironmaking centers are catching the infection. South Staffordshire is enlarging its producing capacities by re-lighting some of the long-dormant furnaces, and has at length a market for its pig iron, whereas, as a leading local man observes, "for a long time there had been no market at all." In the Forest of Dean and South Wales idle mines are being made ready for action, and elsewhere the decks are being cleared, so that at any moment owners of iron works properties may utilize their plant in the manner best calculated to meet the wants of the time being. It cannot be said, nevertheless, that there is any notable change in the manufactured iron departments, although in a few cases orders of some relative magnitude have been received. Prices may go up shortly, but the probabilities are that no very noticeable change will be recorded prior to the quarterly meetings on and about October 9th. An early symptom of the tentative alteration is that given by the

SCOTCH IRONMASTERS' ACTION, taken with the avowed and express intention of checkmating the agitation of the coal miners for higher wages. The colliers had made a demand for sixpence a day more money, and had obtained it from many of the coal owners, especially from those colliery proprietors who sell most of their coal to the public for household or manufacturing purposes. They then made the same request to the employers who are both iron and coal masters. The masters refused to make the concession and promptly decided to blow out 30 out of the whole number of 50 furnaces blowing, so as to throw a large additional quantity of coal on the open market. This decision they made operative last week, so that there are now only 60 Scotch furnaces going. The great Mr. Alexander Macdonald tells the miners they should retaliate by limiting each man's daily output to the extent of half a ton, but up to now I don't hear that the men have adopted his suggestion. I suppose, indeed, that at the existing rate of remuneration, the miners will not be willing to thus reduce their own wages. The ironmasters' conduct is bold and pugnacious. They seem determined to nip the wages agitation in the bud, but they may possibly have another motive—namely, to force up prices by rapid jumps, in the belief that the present demand may not last, and with the knowledge that stocks are large enough to meet almost any given requirements. The issue of the struggle will be anxiously awaited. In the meantime the

DISTRESS IN THE NORTH OF ENGLAND is attracting much attention. The Mayor of Middlesbrough's appeal to the Home Secretary has been published by the newspapers, as also has the reply of that minister, stating that he has no available funds, but will lay the matter before the Chancellor of the Exchequer, so that the matter has been squarely put before the public prior to the advent of the cold weather. Some of the journals have also dispatched "specials" to the Northern iron district, and these gentlemen have turned out "copy" which has been interesting reading matter, as well as having given details of a worse state of affairs than had been known of by most of us. Whether the current revival will be productive of an early amelioration, or whether the distress will deepen as winter comes on, has yet to be demonstrated. It is estimated that there are at least 2100 puddling furnaces idle in different portions of the district, and that there have been thrown out of employment in the North of England alone within the past three years the following large numbers of workmen: Coal miners, Northumbrian, &c., district, 5075; ditto, South Durham, 5694; iron miners, Cleveland, 4000; lead, &c., miners, Northumberland and Durham, 10,000; blast-furnace workers, 800; manufactured-iron workers, 1500; railway and other laborers, 2000; making a total of 29,069 men. It does not follow that the whole of these have remained in the locality. Such is not the case, as large numbers of men who were attracted from the agricultural districts have since "returned to their mittens," and are again following the plow.

EMIGRATION TO THE UNITED STATES continues, but not on a large scale. Thirty engineers and machinists from Bradford have just left by the Lord Clive for Philadelphia, and a Liverpool firm has received instructions from a firm in the Quaker City to send out at least 100 riveters immediately, the American house paying half passage money and guaranteeing three months' work at good wages. I don't think you will hear much more of miners' emigration hence to your side.

SCOTCH PIG IRON is dearer, with a wild warrant market, larger shipments and a greatly reduced production. There are only 65 furnaces blowing in Scotland, against 92 this date last year. Stocks in Connal's stores, however, are shown by John E. Swan & Bros., Limited, to be 307,367 tons—an increase of 365 during the week—which total does not include the stocks in makers' own yards. Total shipments this year have reached 355,000 tons, or 72,494 tons over last year. Ballast pig is now 39/ per ton alongside in Forth or Clyde. Importations into the Scotch ports from Middlesbrough, on the other hand, have diminished to the extent of 41,570 tons on this year's total of 170,623 tons. It is not improbable, under existing conditions, that producers will send most, or all, of their iron into the official stores, so as to get warrants issued for it, which may enable them to realize more rapidly than in any other manner. James Watson & Co. have the following remarks, dated Glasgow, Sept. 20: "During the past week there has been considerable excitement in the Scotch pig iron market, with a very extensive business done at higher prices. On Monday the market was irregular, with business between 48/8 and

48/2, cash, closing at 48/6 3/4 ton. On Tuesday the price declined from 48/7 1/2 @ 47/6, cash. On Wednesday the opening figure was flat at 47/3, improving however to 48/1 1/2, cash, and closing at 47/9 3/4 ton. Yesterday a very large business was done from 47/6 @ 49/ 3/4 ton, closing at 48/9, cash, while to-day the price rapidly advanced to 50/1 1/2, cash, closing with buyers at 49/6 and sellers at 49/7 1/2 3/4 ton. Makers have further advanced their quotations, as may be observed from the undernoted: The shipments last week were 11,443 tons, as compared with 9,792 tons for the corresponding week of 1878." We quote:

	No. 1.	No. 3.
G. M. B., at Glasgow	50/	49/6
Gartsherrie	50/	49/6
Coltness	50/	49/6
Summerlee	50/	49/6
Langloan	50/	49/6
Carbriess	50/	49/6
Caldar, at Port Dundas	50/	49/6
Glenarnock, at Ardrossan	50/	49/6
Eglington	50/6	49/6
Dalmellington	50/6	49/6
Shotts, at Leith	50/6	49/6

AT MIDDLESBROUGH

current figures for pig iron run as under:

G. M. B.	Mottled	34/6
No. 1 Foundry	White	33/
" " "	Refined metal	35/
" " "	Kentledge	44/6
" 4 Forge		35/

All net cash and delivered f. o. b. at makers wharves in the Tees.

American orders for pig and scrap last week are said to have amounted in the aggregate to about 20,000 tons.

A LARGE FAILURE has occurred here during the week, that of L. Stevenson & Sons, Australian merchants, of 1 New Basinghall street, with liabilities set down at about £300,000. The firm was established in 1834, as "Stevenson, Leader & Co." In 1852 the present designation was assumed. The suspension is attributed to the general depression of trade. The house has chiefly carried on business in Manchester and general goods with the up-country Australian dealers, and has been "fixed" by the erection of large warehouses at Melbourne, whereby much capital has been locked up. I know nothing of the special circumstances of this particular case, but I assume that other houses trading with the Antipodes have of late found matters rather trying. Some have, I know, had "their feet in hot water" and have caught cold "to a severe extent." The fact is the Australian markets are not capable of indefinite expansion with their present population. Traders would do well to bear that in mind.

DAMAGES AGAINST EMPLOYERS were for the first time raised at Birmingham on Friday last, under the important provisions of the new Factory Act. The defendants in the case were Messrs. Wilkes, Mapplebeck & Co., tube manufacturers, who were summoned for neglecting to fence a certain mill gearing, in consequence of which a boy had been killed. The act of Parliament, passed last year, requires all such gearing to be fenced, and one of its sections enacts that, should juvenile workers meet with fatalities through the neglect of their employers, the factory inspector for the district may summon the offenders and claim a penalty not exceeding £100 on behalf of the relatives or parents. The case was settled on payment of £25 as a compromise. Its bearing has caused no little consternation among owners of manufactories in the hardware and cutlery trades, many of whose establishments being crowded with machinery, mill-bands, &c., entirely and absolutely unprotected. If the factory inspectors are active they may obtain a number of useful penalties.

AT SHEFFIELD there does, at length, appear to be a change for the better. I have letters which speak more hopefully of immediate prospects than for a long time past. My correspondents inform me that they are beginning to see land at last, and that the cutlery and certain other "light" trades are moving. They think that the long-promised revival has at length come about, although some very justly attribute the changed state of things to the enlarged demand which is invariably experienced toward the close of the year in most of the Sheffield trades proper. I am told that the business in steel, files, cutlery and general trade with the United States has become comparatively large lately, and that there are evidences which go to show that the aggregated transactions of the present year with your market only will prove a startling contrast to the limited values of the past few years. Good judges seem to think that several months' good turnover lie right ahead. One house has just received from France by far the largest order ever placed on its books during any period of its very old history. I do not know how this heavy indent has been made up, but I learn that its magnitude has done something to engender the suspicion that somebody or other has doubts of the future tariff relations between this country and France, and has begun to "load up" in anticipation of possible unfavorable changes. All things are possible, and I should not be surprised to find, sooner or later, that this is the case. As regards cast steel, there is a good call for special brands for engineering purposes, tools and other specific uses, but the commoner sorts do not move off in any bulk. I don't think I mentioned last week the rather sudden death of Mr. Montague Stevenson, of William Jessop & Sons, Limited. Mr. Stevenson had latterly grown amazingly stout, albeit only 37 years old, and that, I hear, had something to do with his early demise. I believe the event does not alter the practical management of the concern in any appreciable degree.

AMERICAN COMPETITION

is reported upon to date by several of the correspondents of the *Ironmonger*. From Birmingham it is communicated that there is less talk of foreign competition than there was a year ago. In some branches your manufacturers are said to have frankly abandoned the field, while in others you are still fighting hard. Your agents are said to be especially successful in machine-made watches, in metal clocks, light castings and in certain sorts of cultivating tools, "novelties," &c. You have lost ground, the correspondent states, in cheap locks, axle pulleys, axes, hoes, enameled hollow-ware,

nails, tacks, lamps, lanterns, scales and weighing machines. The "Wolverhampton and district" correspondent states that your competition is more formidable than that of any other nation. Your people's energy in sending and pushing edge tools at the Cape, Australia and South America is decidedly felt, and complained of by the South Staffordshire makers. Your lock makers, however, have lost their foothold, and your wall brackets and other light castings are no longer purchased, their durability being questioned by the writer of the report. The Sheffield correspondent speaks in similar terms as to the state and status of your competition. He seems to be of opinion that you are only formidable in what he terms "novelties." In Cleveland you wares don't seem to have made their appearance, and the Glasgow correspondent gives it as his deliberate conviction that you have made no progress whatever in Scotland during the past six months. Your harvesters and mowers have made some way, but your ironmongery and general hardware have apparently retrograded. I give these excerpts precisely as I find them in the journal in question. It appears to me that it does American manufacturers no particular harm to have a certain amount of gratuitous publicity, in a generic sense it is true, on this side. Were I asked for an opinion I should presume to say that your heavier wares have little or no prospect of securing firm hold of this market—unless, indeed, another frantic panic period such as 1871-3 should recur. Then anything would be possible. As to American steel I quote the following, which the *Ironmonger* says is penned by "one of the best known and most respected" local manufacturers: "Steel had been manufactured in the United States for 25 years or more prior to 1875, but during those years the makers had not succeeded in establishing confidence in the quality of their steel among the large consumers of the best cast steel. The American steel was only generally used or considered suitable for common purposes, and the makers of tools or implements which required a fine quality of cast steel invariably imported Sheffield-made steel. When, however, coal and iron and wages and profits were so greatly advanced in 1872-73, the price of Sheffield steel became so high that the buyers of it were induced to try the cheaper home-made article, and thus gave the makers of it the opportunity for which they waited and were quick to seize. After repeated trials they succeeded in producing a workable quality, and now our old customers tell us they are content to use home-made steel, and can do without ours. The same thing has occurred in many other departments—infant trades have been strengthened, new ones established, old ones enlarged, until our former customers abroad not only supply their own wants, but are, to some extent, supplying ours. No doubt, when trade revives, this country will obtain a share of it; but rival industries are now so well established in many foreign States that we shall never recover the whole of our lost trade. Trade unions among the workmen, and a want of firmness and enlightened views among manufacturers, have contributed their share to produce the state of things to which I refer in our old established trades; but the last folly was the unwise action of all parties in grasping at too much in a time of prosperity."

THE TELEPHONE EXCHANGE IDEA

has at length taken firm root here, and is likely to extend throughout the whole country; indeed telephonic exchanges have already been announced for Leeds, Manchester, Liverpool, Sheffield, Wolverhampton, Birmingham and certain other large centers of population. The promoters are not unlikely to meet with strenuous opposition from the government postal authorities, who enjoy a monopoly of the telegraph lines of this country, and seek to include this quite new invention within the borders of their old established rights and privileges.

SOUTH WALES AND MONMOUTHSHIRE

are busier, and claim more hopeful prospects. Dowlais, Elbow Vale, Panteg, Landore and Rhymney are all growing more active. The president of the Cardiff Chamber of Commerce says: "As regard the actual condition and prospects of the iron and steel trades of this district, I may state that at the present moment orders are more plentiful, principally from the United States of America, and partially from Italy; there is especially a better demand from America for old material, chiefly old rails and scrap—also for new steel and iron rails. The low rates of freight at which steamers are procurable enable sellers at this end to place the material in the port of delivery at a low cost; if this were not exceptionally the case, probably the iron producers here would get little, if any, of the present overflow of orders from America. Prices obtainable, except as regards old material (which is received in America at a low scale of duty), are not much higher than for some time past, but, as I have said, orders are more plentiful. No very sanguine hopes are held as to future prospects."

Included in last week's shipments were 3060 tons of iron, of which 3000 tons was from Dowlais for Montreal. The tinplate works are going steadily along. Prices of these goods are well upheld, and that is certain to be the case with a continuance of the strong demand from your side.

THE METAL MARKETS

are all fairly strong, and late rates are generally maintained, save as regards tin, which has gone back a shade. Its backwardation, however, has not been formidable, and is unlikely to go further, the Cornish smelters being especially firm.

According to Rollet, the method successfully used at the famous Creusot Works, France, for the estimation of sulphur in metallurgical products, iron ores, fuel, &c., is the following: The substance is heated in a porcelain tube, and a mixture of 75 per cent. of hydrogen and 25 per cent. of carbon acid is passed over it. The sulphur-retted hydrogen formed is conducted into a silver solution, and the sulphide of silver precipitated is weighed. The method is said to be of special value when the amounts of sulphur are small.

The Introduction of the Pig Boiling Process into the United States.—Mr. Edward Nock, a South Staffordshire man, who claims to have introduced the process of boiling pig iron into this country, has been giving its history to a reporter of a Western paper. He is now 77 years old and has been 70 years at work in a rolling mill. At the time he began work, puddling on a sand bottom was the only method in use. As he tells the story, in 1810-20 a man in Wales invented a new method and applied it in one of the tin works. This new process of boiling was called the iron-bottom process, and better tin was made from the iron made in the new way. But even this was not much better than the old way called puddling. About 1830 the process of boiling was discovered by Joseph Hall, of Bloomfield, England. He kept his process a secret, but some of his men found it out and carried it with them over Europe. In the fall of 1836 Mr. Nock came to this country for the second time, and in 1837, at the new mill of Lawrence & Cuddy, at Pittsburgh, the first boiling furnace was built and the first pig boiling in the United States done.

Special Notices.

PROBATE SALE

OF VALUABLE
Factory, Machinery, &c.,
AT SOUTH NORWALK, CONN.

Pursuant to an order of the Court of Probate for the District of Norwalk, will be sold at public auction on

WEDNESDAY, the 15th day of October, 1879,

At 11 o'clock forenoon (unless previously disposed of at private sale), the valuable real estate lately belonging to the Norwalk Iron Works Company, and also all the Tools and Machinery, Boilers and Engines, Shafting and Belting, Foundry, Furnace and Cranes, all in running order and suitable for a first-class machine shop of large capacity; also Patents and Patterns of Steam Engines and Pumps. Said real estate adjoins the track of the N. Y. N. H. & B. R. Co., and has a convenient dock on Norwalk Harbor. The subscriber has been specially authorized by said court to make said sale.

Sale to take place on the premises. Terms and conditions made known at time of sale.
TALLMADGE BAKER.
SOUTH NORWALK, Sept. 4, 1879.

AUCTION NOTICE.

RISSELL & WELLES, Auctioneers,

Friday, Oct. 17th, at 10 o'clock.

At 83 Chambers and 65 Reade Sts.

Regular sale of Hardware and Cutlery. Also, at 12 o'clock, Peremptory Sale of over 1500 kegs Nails, asst., as follows: About 100 kegs Slate Nails, asst., 2d, 3d, and 4d; about 100 kegs Box and Casing Nails, asst., 6d, 8d, 10d, 12d, 14d, 16d, 18d, 20d, 22d, 24d, 26d, 28d, 30d, 32d, 34d, 36d, 38d, 40d, 42d, 44d, 46d, 48d, 50d, 52d, 54d, 56d, 58d, 60d, 62d, 64d, 66d, 68d, 70d, 72d, 74d, 76d, 78d, 80d, 82d, 84d, 86d, 88d, 90d, 92d, 94d, 96d, 98d, 100d; about 50 kegs Clinch Nails, asst., 2 1/2 and 3 in.; about 350 kegs Finishing Nails, asst., 6d, 10d, 12d, 14d, 16d, 18d, 20d, 22d, 24d, 26d, 28d, 30d, 32d, 34d, 36d, 38d, 40d, 42d, 44d, 46d, 48d, 50d, 52d, 54d, 56d, 58d, 60d, 62d, 64d, 66d, 68d, 70d, 72d, 74d, 76d, 78d, 80d, 82d, 84d, 86d, 88d, 90d, 92d, 94d, 96d, 98d, 100d; about 470 kegs Brad Head Nails, asst., 6d, 8d, 10d, 12d, 14d, 16d, 18d, 20d, 22d, 24d, 26d, 28d, 30d, 32d, 34d, 36d, 38d, 40d, 42d, 44d, 46d, 48d, 50d, 52d, 54d, 56d, 58d, 60d, 62d, 64d, 66d, 68d, 70d, 72d, 74d, 76d, 78d, 80d, 82d, 84d, 86d, 88d, 90d, 92d, 94d, 96d, 98d, 100d; about 250 kegs Fence Nails, asst., 3d, 4d, 5d, 6d, 7d, 8d, 9d, 10d, 11d, 12d, 13d, 14d, 15d, 16d, 17d, 18d, 19d, 20d, 21d, 22d, 23d, 24d, 25d, 26d, 27d, 28d, 29d, 30d, 31d, 32d, 33d, 34d, 35d, 36d, 37d, 38d, 39d, 40d, 41d, 42d, 43d, 44d, 45d, 46d, 47d, 48d, 49d, 50d; about 20 kegs Spikes, asst., 3, 3 1/2, 4, 4 1/2, 5 in.; also, about 12 tons Best Crucible Cast Steel.

Special Notice.

Having recently increased our facilities, we beg leave to call your attention to the fact that we are now prepared to do all kinds of general Machine Work, both light and heavy; making

REPAIRS TO CORLIS

and other Steam Engines, &c. We Rebores Cylinders in their present positions, from 3 to 110 inches; also all makes and sizes of

Steam Hammers and Blowing Engines, and refits Slide Valves with a new and greatly improved apparatus. Employing none but the best of help in this branch of our business, we can confidently assure our customers that their interests will be promptly and faithfully attended to. We manufacture a PATENT SPIRING PISTON PACKING, which has been in use for some 10 years past, giving the best satisfaction. We make and furnish the Elliptic Spring when desired. We have on hand a large assortment of Piston Rings and Piston Head Patterns. Also all kinds of Corliss Valve Patterns. All work guaranteed. Illustrated circulars sent upon application.

L. R. FLANDERS MACHINE WORKS,
No. 1025 Hamilton St., Philadelphia, Pa.

PATENT CONCAVE FORGED

OX SHOES.

The only perfectly fitting Shoe, and the best and cheapest.

GREENFIELD TOOL CO.,

Greenfield, Mass.

For Sale,

Established light Hardware Manufacturing Business in this city, making some 20 staple light articles, paying a profit of 40 per cent. Can show list of largest houses as customers. Part pay taken in goods to be made. Owner in another kind of business that takes all his time, the reason for selling. Price, \$2500; favorable terms; or a first mortgage on real estate taken for it.

Address: 183 Sixth Avenue, Brooklyn, N. Y.

HARDWARE.

FOR SALE OR TO LET.

A valuable Iron Mining Property, near Dover, Morris County, New Jersey, on very favorable terms.

For particulars address
E. L.,
Care Post Office Box 4004,
New York City.

FOR SALE OR TO RENT.—The valuable property known as Mount Penn Charcoal Furnace, including 120 acres good farming land, situated about 3 miles from Reading and 7 miles to N. Y. N. H. R. Ore convenient and wood in abundance, having ample facilities for shipping product to market. The above Furnace having the reputation of making one of the best irons in the market when in blast. Address: GEO. SHALTER, Reading, Pa.

WANTED.

Employment here or elsewhere, in any useful capacity, by a man of ability and approved character, experienced in manufacturing and mercantile business. Is a capable office and business manager, cashier, accountant, correspondent and indoor salesman. Has been connected with the Iron and Hardware trade. Satisfactory reference. Address: Office of The Iron Age, 83 Reade St., New York.

WANTED.

A Good Hardware Store.

Address, with particulars and terms, J. H.,
Lock Box 34, Lebanon, Pa.

JUST PUBLISHED—SENT FREE.

Complete History of Wall Street Finance, containing valuable information for investors. Address: BAXTER & CO., Publishers, 17 Wall Street, New York.

Special Notices.

EXECUTORS' SALE OF AN

Anthracite Blast Furnace.

The subscribers, executors of the last will and testament of Peter Uhler, late of the Borough of Easton, Pa., deceased, will sell at public sale, at the Circle, in said Borough, on

THURSDAY, October 16, 1879,
At 2 o'clock P. M.,

all that certain Anthracite Blast Furnace, located in the Borough of Glendon, about two miles from Easton. The tract of land contains about 15 acres, and lies between the Lehigh Canal and Lehigh River, just below the Chain Dam, adjoining Glendon Iron Company's furnaces. The furnace erected thereon is a sheet iron casing stack, 14 1/2 feet high, with closed top; 1 1/2 ft. Morris & Co.'s low pressure condensing engine, 8 boilers, 2 Kent's hot-blast ovens, casting house, engine house, steam hoist, &c. Also 11 good tenement houses, large store, two stables and a blacksmith shop. The furnace buildings are of brick and stone and put up in the best manner, with all the modern improvements. The works were built in 1871, and are in good order and nearly ready to blow in. Stock can be supplied by boats on Lehigh and Morris Canals or Lehigh Valley Railroad. Hematite ores can be delivered to the furnace for \$2.50 per ton and limestone for 30 cents per ton. The terms and conditions will be made known on day of sale by
E. L. UHLER,
S. L. HUNT,
Executors.

Sale positive to close up the estate.

Rolling Mill for Sale.

The Real Estate, Machinery, Fixtures and Tools of the PORTLAND ROLLING MILLS will be sold at public auction, without reserve, to the highest bidder, at the mills.

TUESDAY, September 30, 1879,
At 3 o'clock P. M.

The property of the company consists of 60 acres of land on tide water, in the town of Cape Elizabeth, Cumberland County, within ten minutes' drive of the city of Portland. Besides the mill buildings the company owns 55 tenements in 23 buildings, one hall used for church purposes, two stores and a thoroughly well fitted office, with fire-proof vault and all modern improvements. All the buildings are in good repair.

The mill contains one 10-inch train, and one 18-inch train, with all the machinery appertaining thereto, at which vessels of 800 tons capacity can lie at low water, and is directly connected by rail with all the railroads centering at Portland.

The mill is now in active operation, but possession will be given about the 15th of October, 1879.

PHILIP HENRY BROWN, President,
Portland, Maine.

Special Notice.

Hardware Manufacturers' Exchange,

43 Chambers Street, New York.

The undersigned desires to inform all Manufacturers of Hardware throughout the United States that he has fitted up rooms, centrally located, well lighted, &c., running through from Chambers to Reade street, for the exhibition of manufactured goods in all lines of hardware. Any manufacturer can at a small annual cost exhibit his wares to actual buyers throughout the year, and all visitors can examine them free.

The advantages to both manufacturers and buyers are too apparent to need any explanation. For further particulars and application for space address

W. G. FULTON, Manager.

Hardware Patterns for Sale.

Embracing a full line of Hat and Coat Hooks, Pullies, Grindstone Fixtures, Turnbuckles, Bolts, Well Wheels, Thumb Latches, Casters, Brackets, Drawer Pulls, Sash Fasteners, Sash Lifts, Shutter Bars, Cupboard Catches, Latches and Turns, Flush Bolts, Stove Door Handles, &c. These patterns are all in complete order, ready for immediate use, and cover the entire line of general hardware lately manufactured by us. Also the Hardware patterns and patents purchased from the J. & D. Manufacturing Company a short time since.

We have wood cuts and price lists of the various articles. Having leased our works for a series of years, we offer these patterns in the whole or in part, at low rates on easy terms of payment. Under the terms of our lease they can only be sold for use west of the Allegheny Mountains. For terms and further information apply to

KEYSTONE HARDWARE MFG. CO.,
Reading, Pa.

Wanted,

Several manufacturers to join the advertiser in sending a traveler into Central America. By joining this pool will be represented by a first-class man and at a small expense. This is a good opportunity for parties wishing to introduce their goods in foreign markets.

Address for three days C. A.,
Office of The Iron Age, 83 Reade Street, N. Y.

FOR SALE.

Stove and Hardware stock, fixtures and business in one of the best towns on the Hudson River. From \$2000 to \$5000 required. Satisfactory reasons for selling. A rare chance.

Address: HARDWARE,
Box 80,
Office of The Iron Age, 83 Reade St., New York.

FOR SALE.

First-Class Retail Hardware Store

On one of the principal streets. About \$3000. New stock. Address,
J. G. BRENNER, SON & CO.,
21 N. Fifth St., Philadelphia.

SITUATION WANTED

by a first-class double entry bookkeeper and correspondent. Moderate salary expected. The advertiser has had many years' factory experience. Address
WM. HARNETT,
234 East 29th St., New York.

AN EXPERIENCED Mechanical Draughtsman

accustomed to heavy rolling mill work, can find employment for a few months by addressing
A. B.,
Office of The Iron Age, 83 Reade St., New York.

WANTED—The exclusive services of an engineer, or otherwise, of sterling integrity, energy and sobriety, who has large experience in the construction and management of coke furnaces. Undoubted references required.

Address: P. O. Box 30, Philadelphia, Pa.

FOR SALE OR RENT.—The Pequest furnace and 200 acres of ore and limestone; land can be sold or leased at a reasonable price; land

Address: E. DALLETT HEMPHILL,
Lock Box 26, Allentown, Pa.

Special Notices.

PARK BENJAMIN'S

SCIENTIFIC EXPERT

OFFICE,

37 Park Row, New York.

Examines and reports on the novelty of inventions. Furnishes recipes and information on all industrial processes. Prepares drawings and engravings of machinery. Tests, designs, constructs and selects machinery. Address,
G. H. BENJAMIN,
Business Manager.

FOR SALE.

A valuable property in the State of Wisconsin, free from all incumbrances, embracing an inexhaustible deposit of Iron Ore and about 600 acres of land, of which about 700 acres are covered with heavy growth of large oaks and other hardwood timber. The ore is rich and free from even a trace of phosphorus. The facilities are unusually favorable for the manufacture of a superior quality of charcoal iron, and at cheap, if not cheaper, than can be manufactured elsewhere in the United States.

It is on the line of one of the leading railroads of the State, and is accessible to all Mississippi ports and the lake or Great Lakes.

The veins or mines are to a certain extent developed, and had been successfully worked for some time.

The greater part of the land would be well fitted for farming purposes, as the ground is very fertile, and the price asked for it will not exceed that asked for common farming land. Property in New York City or vicinity will be taken in exchange.

For information apply to or address the proprietor,
JULIUS W. HAAS,
Dubuque, Iowa.

Or EDWARD MULLER,
Care BIZLOW & Co.,
P. O. Box 135, Newark, N. J.

FOR SALE OR LEASE.

A MANUFACTURING ESTABLISHMENT

IN SCRANTON, PA.

On corner of two main streets, only one-quarter mile on level road from two railway stations. Size of lot 50 by 150 feet; main building, 30 by 100 feet; engine, 35-horse power. Buildings and machinery first-class and nearly new.

Underlaid and surrounded with coal, the cost of fuel for steam is merely nominal. Best forge coal \$1.50 per ton. With complete lines of shafting, &c., the horse-power engine, air and two 40 feet rollers, &c., can be easily and cheaply adapted to any light manufacturing business.

Former proprietor, after successfully manufacturing Axes and Edge Tools in the vicinity for 30 years, designed and built this shop as an expansion for the continuance of the business, but failed during the late depression.

Having neither time nor ability to run these works, I will sell very low on easy terms.

Address,
AMBROSE MULLEY,
Providence, Lackawanna County, Pa.

For Sale,

THE ROUGH AND READY HOT BLAST

CHARCOAL FURNACE

situated in one of the healthiest regions of Tennessee, with all its modern improvements, including a 30-horse-power engine, air and two 40 feet rollers. The furnace is in close proximity to inexhaustible supplies of rich brown hematite ore and limestone, and the rail and river shipping facilities are excellent. This can be manufactured for not exceeding \$150 per ton, and put into market within 24 hours. Furnace can be put into blast without much expense for repairs. Included in the property are 5000 acres of fine timber land, (including 1500 acres which are improved and under cultivation) a Saw and Grind mill with a 12-horse-power engine fuel boiler, Carpenter and Blacksmith shops, Stables and Cribbs, Coal Engine, Cider, Castering, Tool Store and Ware, and about 60 Dwelling Houses. It is the wish of the undersigned to sell the whole of this property, which can be bought on reasonable and liberal terms. For further particulars

Address,
D. THEOBALD, Youngstown, Ohio.

A. GUCKENHEIMER & BRO.,
93 First Avenue, Pittsburgh, Pa.

EXPERIMENTAL

MACHINERY

Developed and Perfected.

Special attention given to requirements of

HARDWARE MANUFACTURERS.

Address for information and terms,
RICHARDS & DOLE, Springfield, Mass.

WE QUOTE FOR

Steel or Iron Rails, Steel Tires,

Axles, Forgings, Bars, Plates,

Nail Sheets Billets,

and all Steel goods f. o. b. any British port, or c. i. f. any United States port. Thirty years' experience in the Steel Trade.

NIXON BROTHERS,

Newcastle-on-Tyne, ENGLAND.

A New Ax Factory For Sale at Half Cost.

Built with all modern improvements and at panic prices in 1876. Building, machinery and engine all complete, in first class order, ready to start; capacity about 1500 axes or tools per day. Both steam and water communication with coal mines, New York and the West. Coal landed in bins from canal without cartage. Location in great iron manufacturing center. Address
A. H. HANSON, Cohoes, N. Y.,
Provident Life Insurance Co.,
Western Union Building, New York.

Mining & Manufacturing

Property

For Sale or To Let.

A valuable property in New Jersey, at a railway station, consisting of rich Iron Mines, unexcelled Water Power, large Factory and Farm. Will sell all or part, or lease the Factory with Machinery, or the Mine. For particulars apply to
THOS. H. STOUT,
79 Cedar St., New York.

Wholesale Cutlery.

A favorable opportunity is offered to an active man, with a capital of at least \$25,000, to take the place of a retiring partner in a leading Cutlery business in one of the principal Western cities. For particulars address
H. W.,
P. O. Box 46, New York.

Special Notices.

JOHN E. SWAN & BROTHERS,

IRON MERCHANTS,

Glasgow and Middlesbrough,

Exporters of all brands of

Scotch & English Pig Iron.

c. f. i. to America and f. o. b. British ports.

Old Iron Rails, Puddled Bars

AND MANUFACTURED IRON.

Rolling Mill Property for Sale.

Eight contiguous pieces of ground in the borough of Columbia, Lancaster county, Pa., containing together about 15 1/2 acres, upon which are erected a Rolling Mill, with necessary machinery for manufacturing railroad iron, &c.; a one-story brick office; a one-story frame office; ten two-story brick dwelling houses; two frame dwelling houses; a brick machine shop and foundry; frame blacksmith shop; frame barn and other improvements.

The above property is conveniently and eligibly situated on the line of the Pennsylvania Railroad, and is well adapted to the attention of iron manufacturers. For particulars apply to
H. M. NORTH, Columbia, Lancaster Co., Pa.

WANTED.—A partner in an established Foundry and Machine Shop near Philadelphia. One who can furnish work preferred to one investing capital. Best references given and required. Apply to
GENDELL & REEVES, Attorneys,
No. 631 Walnut Street, Philadelphia, Pa.

Combined Shear, Punch, Upsetter

and Bender,

REED & BOWEN'S PATENTS.

Parties having standard articles and wishing special agency would do well to correspond with us.

STANDARD MANUFACTURING CO.,
107 Liberty Street, New York.

FOR SALE.

Boiler, 150-horse-power engine, 300-horse-power and other smaller sizes. Also machinery for rolling steel tires complete. Machinery for making ice with the greatest economy. One steam canal boat warranted the best ever invented. Two large geared foundry ladles. All modern build.

Apply or address
LESLIE,
70 Pearl Street, Jersey City.

TO IRONMASTERS.—Wanted a situation as Rolling Mill Manager by a practical man. Has held similar position before 8 years in one place. Can give good references. Address,
SAM'L T. HODGKINS,
2208 Etna Street, South Cleveland, Ohio.

To Manufacturers of Iron for

Steel Purposes.

DUPUY'S DIRECT PROCESS

Produces bars direct from ore, in one heat, at low cost, in ordinary Reverberatory Furnaces. It is indorsed by steel manufacturers to be equal to best Swedish iron for high grades of steel.

For information apply to
P. S. JUSTICE,
No. 14 North Fifth Street, Philadelphia.

Blast Furnace for Sale or to Lease.

Situated on the Hudson. Size, 16x60, with first-class blowing machinery, ovens, tools, &c. The location for transportation of stock to the Furnace and iron to the market is most excellent. There is a fine dock and good appliances for handling material. Iron can be made here very low, and at present prices at a good profit.

PANCOAST & TARR,
28 Flatt St., New York.

FOR SALE.

Hardware Stock and Fixtures in one of the best towns in Nebraska. Will be sold low for satisfactory reasons. About \$2500 required. A splendid chance.

Address,
HARDWARE,
Box 21, Lincoln, Neb.

FOR SALE.

Rail or Bar Train complete, with rolls for rolling rails from 12 to 65 lbs., and also for all sizes of bar iron, flats, rounds and squares, in perfect condition, having been in use for a short time only.

For terms, &c., apply to
J. M. BROWNSON,
P. O. Box 748, Pittsburgh, Pa.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, October 8, 1879.

The past week has been one of healthy activity in the financial markets. Money has continued firm and in active demand at one-eighth of 1 per cent per day and 7 per cent annum, declining toward the close to 4 @ 5 per cent. The gold receipts this week from foreign sources amount to \$2,229,600. At the annual meeting of the Clearing House Association yesterday, it was resolved that the issue of gold certificates of deposit by the Bank of America, these to be used in settlements at the Clearing House, be resumed. This is returning to the custom which prevailed up to 1862. The reason for this action is that it is more convenient to deposit the gold in a bank having large and secure vaults and to use certificates of such deposits, than it is to carry the gold in bags every day and from the Clearing House. This action has become necessary on account of the abundance of gold coin by reason of the large importations and the disbursements by the Treasury of gold coin in payment of called bonds.

Government bonds have been steady and active, with prices a fraction higher, as will be noticed in the table published below giving the closing quotations. Railroad bonds have been active and higher, Erie leading.

The stock market has been very active and strong, with Erie shares the feature of chief interest. After Erie, the most active stocks have been D. L. & W., Pacific Mail, Iron Mountain, Union Pacific, Delaware and Hudson, Wabash, Kansas and Texas, Northwestern, St. Paul, and Lake Shore. We give below the closing quotations of active shares.

The bank return shows a decrease of \$2,306,925 in surplus reserve, which now stands at \$262,425, against \$7,436,050 at this time last year, and \$8,490,350 at the corresponding period in 1877. The loans show a gain this week of \$5,600,600; the specie is up \$131,700; the legal tenders are decreased \$1,054,200; the deposits other than United States are up \$1,937,700, and the circulation is increased \$400,500.

The following is an analysis of the bank totals of this week compared with that of last week:

	Sept. 27.	Oct. 4.	Comparisons.
Loans.....	\$250,763,700	\$266,364,300	Inc. \$15,600,600
Specie.....	20,017,400	21,149,100	Inc. 1,131,700
Legal tenders.....	40,047,700	38,993,500	Dec. 1,054,200
Total reserve.....	60,065,100	59,242,600	Dec. 822,500
Deposits.....	229,953,000	231,920,700	Inc. 1,937,700
Reserve required.....	57,405,750	57,858,175	Inc. 452,425
Surplus.....	3,559,250	28,462,525	Inc. 2,306,925
Circulation.....	21,531,900	21,932,400	Inc. 400,500

The foreign trade movements at the port of New York since our last issue are shown in the following tables:

IMPORTS.

For the week ended October 4:

	1877.	1878.	1879.
Dry goods.....	\$1,378,079	\$1,274,509	\$2,214,144
General misc.....	4,351,030	5,019,693	5,007,514

Total for week.....\$5,729,709

Prev. reported.....\$7,194,508

Since Jan. 1.....\$255,130,311

\$221,908,380

\$247,295,780

Included in the imports were items of merchandise valued as follows:

	Quantity.	Value.
Alvils.....	119	\$1,061
Brass goods.....	23	4,274
Bronzes.....	24	5,093
Copper.....	26	9,738
Cutlery.....	96	25,815
Guns.....	105	16,777
Hardware.....	37	1,179
Iron, hoop, tons.....	59	1,063
Iron, pig, tons.....	3510	46,468
Iron, sheet, tons.....	28	3,240
Iron, railroad bars.....	6,553	38,744
Iron, cotton ties.....	29,093	26,094
Iron, ore, tons.....	1,650	3,591
Iron, other, tons.....	4,700	40,536
Lead, pigs.....	1,000	3,078
Metal goods.....	203	17,025
Nails.....	46	3,591
Needles.....	27	11,554
Nickel.....	30	3,336
Old metal.....	30	3,336
Plating.....	1	49
Plated ware.....	1	49
Percussion caps.....	26	4,830
Saddlery.....	10	1,079
Steel.....	198	16,737
Silverware.....	6	429
Tin, bxs.....	24,930	108,935
Tin, 200 slabs.....	2	4,477
Wire.....	10	1,147

EXPORTS, EXCLUSIVE OF APPROPRIATE.

For week ended October 7:

	1877.	1878.	1879.
For the week.....	\$6,373,559	\$7,183,567	\$7,490,832
Prev. reported.....	209,508,238	261,444,408	231,873,967

Since Jan. 1.....\$215,921,674

\$268,627,072

\$261,294,780

EXPORTS OF SPECIE.

For the week ended October 4:

	1877.	1878.	1879.
Total for week.....	\$4,564,577		
Previously reported.....	39,709,085		

Total since Jan. 1, 1879.....\$44,273,663

Government bonds at the close were quoted as follows:

	Bid.	Asked.
U. S. Currency 6's.....	123	124
U. S. 6's 1880 registered.....	104	104 1/2
U. S. 6's 1880 coupon.....	104	104 1/2
U. S. 6's 1881 registered.....	105	105 1/2
U. S. 6's 1881 coupon.....	105	105 1/2
U. S. 5's 1881 registered.....	102 1/2	103
U. S. 5's 1881 coupon.....	103	103 1/2
U. S. 4 1/2's 1881 registered.....	105 1/2	106
U. S. 4 1/2's 1881 coupon.....	105 1/2	106
U. S. 4's 1897 coupon.....	102 1/2	103
U. S. 4's 1897 coupon.....	102 1/2	103

The following were the closing quotations of active shares:

	Bid.	Asked.
Alton and Terre Haute.....	15 1/2	17
American District Telegraph.....	33	34
Atlantic and Pacific Telegraph.....	35	36
Burlington and Quincy.....	114 1/2	115 1/2
Canada Southern.....	69 1/2	70 1/2
Canton.....	48	49 1/2
Col. Chicago and Ind. Central.....	12 1/2	13
Cleve. Col. Cin. and Ind.....	60	62 1/2

Chicago and Alton.....	95 1/2	96 1/2
Chesapeake and Ohio.....	11 1/2	12 1/2
" 1st Pref.....	20 1/2	21 1/2
" 2d Pref.....	13	14
Delaware, Lack. and Western.....	73 1/2	74 1/2
Delaware and Hudson Canal.....	63 1/2	64 1/2
Express-Adams.....	103 1/2	104 1/2
" American.....	57 1/2	58 1/2
" United States.....	51 1/2	52 1/2
" Wells, Fargo & Co.....	102 1/2	103 1/2
Erie.....	38 1/2	39 1/2
" Pref.....	63 1/2	64 1/2
Harlem.....	150	151
Hannibal and St. Joseph.....	29 1/2	30 1/2
" Prof.....	58 1/2	59 1/2
Illinois Central.....	91 1/2	92 1/2
Ind. Cincinnati and Lafayette.....	75 1/2	76 1/2
Kansas Pacific.....	73 1/2	74 1/2
Kansas and Texas.....	95 1/2	96 1/2
Lake Shore.....	95 1/2	96 1/2
Louisville and Nashville.....	63 1/2	64 1/2
Michigan Central.....	87 1/2	88 1/2
Morris and Essex.....	95 1/2	96 1/2
Mobile and Ohio.....	95 1/2	96 1/2
New Jersey Central.....	63 1/2	64 1/2
Northwestern.....	85 1/2	86 1/2
" Pref.....	102 1/2	103 1/2
Northern Pacific.....	25 1/2	26 1/2
" Prof.....	52 1/2	53 1/2
Ohio and Mississippi.....	22 1/2	23 1/2
Pacific Mail.....	51	52
Panama.....	166	167
Rock Island and Pacific.....	130 1/2	131 1/2
St. Louis and Iron Mountain.....	45 1/2	46 1/2
St. Louis Kansas City Northern.....	20 1/2	21 1/2
" Prof.....	53 1/2	54 1/2
St. Louis and San Francisco.....	18 1/2	19 1/2
" 1st pref.....	22 1/2	23 1/2
St. Paul.....	72 1/2	73 1/2
" Prof.....	98 1/2	99 1/2
Sutro Tunnel.....	3 1/2	4 1/2
Union Pacific.....	87 1/2	88 1/2
Wabash.....	45 1/2	46 1/2
Western Union Telegraph.....	93 1/2	94 1/2

GENERAL HARDWARE.

There is little, if any, change to note in the condition of the Hardware market since our last writing. Prices continue unsettled, and advances are of such frequent occurrence that quotations in many lines of goods are withdrawn altogether, and are only given on application. During the week, notices of withdrawal of quotations have been issued by the following manufacturers:

Sidney Shepard & Co., Buffalo, N. Y.
J. Lloyd Haigh, New York.
John Toler, Sons & Co., Newark, N. J.
C. T. Draper & Co., Sing Sing, N. Y.
The Nason Mfg. Co., New York.
Richardson Bros., Newark, N. J.
Otis-Ford Fork Mills, Girard, Pa.
Penfield Block Works, Lockport, N. Y.

On the 4th inst. the manufacturers of Coffee Mills advanced prices from discount 25 per cent. to discount 20 per cent.

A meeting of the makers of German Snaps was held in this city to-day, at which the price was advanced to discount 60 per cent. to the regular trade.

The Dibble Mfg. Co. inform us, under date of 7th inst., of an advance of 20 per cent. on the price of Hemacite Door Knobs.

The Stamped Ware Manufacturers' Association of the United States have advanced the price of Common and Deep Plain and Retained Ware to discount 15 per cent. This advance went into effect on Monday, 6th inst. At the same time the following goods were advanced: Polished Fry Pans to discount 50 per cent.; Round and Oval Hammered Bake Pans to 17 cents per lb., net; Oblong and Square Favorite Bake Pans to 14 cents per lb., net.

The Reading Hardware Co. have issued, under date of the 1st inst., a new discount sheet, to apply to their 1877 catalogue and supplement of 1878. They have also issued, under date of September 20, their revised Lock List. Owing to the pressure of matter on our columns, we are unable to present their lists and discounts this week.

Heaton & Denckla, Philadelphia, Pa., have issued a list of their stock of English Traces and other Chains, Anvils, &c., manufactured by Samuel Lewis & Co., and which they will close out at reasonable figures.

The Atlantic States Nail Association, at their meeting in this city on Thursday last, advanced the card rate to \$3.60, net. At this price the market is firm. Stocks continue light, with assortments, as a rule, broken. We quote rod. to 60d. \$3.60 net for lots of 100 kegs and upward. Small parcels are quoted at an advance of 15 to 25 cents per keg.

The E. Stebbins Manufacturing Company, Springfield, Mass., have issued, under date of 1st inst., a revised price list of their "Brightwood Compression Work," which we print below. This list is subject to discount 40 per cent.

PRICE LIST BRIGHTWOOD COMPRESSION WORK.

Plain Bibbs.			
Per doz.....	\$9.00	11.00	13.50
Plain Bibbs, Screw Shank and Shoulder.			
Per doz.....	\$10.00	12.00	14.50
Hose Bibbs.			
Per doz.....	\$10.00	12.00	15.00
Hose Bibbs, Screw Shank and Shoulder.			
Per doz.....	\$11.00	13.00	16.00
Wash Tray Bibbs, Straight.			
Per doz.....	\$10.00	12.00	15.00
Wash Tray Bibbs, Straight, Flange and Thimble.			
Per doz.....	\$11.00	13.00	16.00
Plain Bibbs, Flange and Thimble.			
Per doz.....	\$10.00	12.00	15.00
No. 1 1/2 Comp. Basin Cocks.			
Per doz.....	\$14.00	17.00	19.00
Nickel Plated.			
Per doz.....	\$14.00	17.00	19.00

The Tack Manufacturers' Association have issued, under date of 4th inst., the following discounts, to apply to the hardware list of May, 1878:

	Per cent.
Swedes Iron, Upholsterers', Climp and Ledge Tacks.....	50
Swedes Iron Tinned Tacks.....	50 to 10
Common Iron Tinned Tacks.....	50 to 30
Copper Tacks and Nails.....	50 to 30
Common Iron Cut Tacks.....	50 to 30
Leathered Carpet.....	45

Finishing, Trunk and Clout.....45
Balance of East and West.....45
Above discounts subject to change without previous notice.

We invite attention to the advertisement of Bissell & Welles, on the 16th page. They will sell at auction on Friday, Oct. 17, at 10 o'clock, at their salesrooms, Nos. 83 Chambers and 65 Reade streets, 1500 kegs of Nails and about 12 tons Best Crucible Steel. The assortment of Nails will be found in the advertisement.

Parties desirous of introducing their goods in Central America, will learn of an opportunity by referring to the advertisement signed "C. A.," which appears on the 16th page.

Van Wagoner & Williams have advanced the price of Gem Door Springs to 10 per cent. from list, and Domestic Blind Adjusters to 20 per cent. from list. They will shortly issue a new price list of the goods of their manufacture.

In our last issue we published the advances in list prices of some of the leading Lock manufacturers, since which we have received the following:

NORWICH, CONN., Sept. 20, 1879.
We this day advance list prices as follows:

No. H.....	\$1.10	No. P.....	\$1.65	No. Y.....	\$3.10
" K.....	2.55	" R.....	2.75	" S.....	1.05
" L.....	2.65	" T.....	2.85	" U.....	2.70
" M.....	2.65	" W.....	3.00	" V.....	2.70

Prices subject to change without notice. All orders subject to rates ruling on day of shipment. NORWICH LOCK MFG. CO.

The Union Mfg. Co. have issued the following discount sheet:

NEW BRITAIN, CONN., Oct. 1, 1879.
DEAR SIR: We beg to inform you that we have this day made the following changes in discounts of Butts:

	Dis. per cent.
Cast Narrow Fast Joint Butts, Drilled and Wire Jointed, No. 80.....	40 to 10
Cast Narrow Fast Joint Butts, Drilled and Wire Jointed, No. 82.....	45 to 10
Cast Narrow Loose Joint Butts, Drilled and Wire Jointed, No. 83.....	50 to 10
Cast Broad Loose Joint Butts, Drilled and Wire Jointed, No. 84.....	50 to 10
Cast Parliament Butts, Drilled and Wire Jointed, Nos. 75 and 85.....	50 to 10
Cast Mayer's Hinges, Drilled and Wire Jointed, No. 86.....	50 to 10
Japanned Loose Joint Butts, without Acorns, Nos. 54 and 57.....	50 to 10
Japanned Loose Joint Butts, with Japanned Tips, Nos. 58 and 59.....	50 to 10
Japanned Loose Joint Butts, with Silvered Tips, Nos. 56, 59 and 89.....	50 to 10
Japanned Fast Joint Butts, without Acorns, No. 60.....	40 to 10
Japanned Fast Joint Butts, with Japanned Tips, No. 61.....	40 to 10
Japanned Fast Joint Butts, with Silvered Tips, No. 62.....	40 to 10
Figured Loose Pin Butts, with Japanned Tips, Nos. 63 and 64.....	50 to 10
Figured Loose Pin Butts, with Silvered Tips, Nos. 65 and 66.....	50 to 10
Figured Loose Pin Butts, without Acorns, Nos. 67 and 68.....	50 to 10
Japanned Parliament Butts, without Acorns, Nos. 70 and 71.....	50 to 10
Japanned Loose Joint Butts, with Japanned Tips, No. 72.....	50 to 10
Japanned Loose Joint Butts, with Silvered Acorns, No. 73.....	50 to 10
Japanned Parliament Butts, with Silvered Acorns, No. 77.....	50 to 10

Terms cash, 30 days. Prices subject to change without notice. Yours respectfully,

UNION MANUFACTURING CO.

Warehouse, No. 98 Chambers st., N. Y.

We have received the following circular showing the discounts adopted by the Pump Manufacturers' Association at a meeting held in Chicago, Ill., on the 1st inst.:

Office of W. & B. DOUGLAS,
MIDDLETOWN, CONN., October 3, 1879.
At a meeting of the Pump Manufacturers' Association of the United States, held at Chicago, Ill., October 1, 1879, the following prices were unanimously adopted:

	Dis. per cent.
Cistern and Pitcher Pumps.....	40
Drive Well, Yard and Set Length Lift and Set Length Force Pumps.....	35
Iron and Brass Cylinder Force Pumps, Single or Double Acting for hand use, Brass Cylinder Cistern and Pitcher Pumps and Hand Boiler Pumps.....	30
Hydraulic Rams.....	25
Garden Engines.....	20

Respectfully soliciting your orders, we remain, very truly yours,
W. & B. DOUGLAS.

The Charles Parker Co., Meriden, Conn., and No. 97 Chambers street, New York, in a circular to the Hardware trade under date of 2d inst., say:

"On and after this date the discount on Parker's Patent Blind Hinges, for full cases, will be 50 and 10 per cent."

The list for these goods was published in our issue of 2d inst.

We have received the following circulars:

CIRCULAR.

At a meeting of the Auger and Bit Manufacturers, held at the Astor House, New York, October 7, 1879, the following list of Auger Bits was unanimously adopted, to take effect that date:

Per doz.....	3	4	5	6	7	8-16
" 3.....	3.00	3.00	3.25	3.25	3.50	
" 4.....	4.00	4.00	4.50	4.50	5.00	
" 5.....	5.00	5.00	5.50	5.50	6.00	
" 6.....	6.00	6.00	6.50	6.50	7.00	
" 7.....	7.00	7.00	7.50	7.50	8.00	
" 8-16.....	8.00	8.00	8.50	8.50	9.00	14.00

In Sets.

Qrs.....18 21 24 30 36

" 3 3 3 3 3 3

List of Augers to be as heretofore.

It was agreed also that the discount on Augers and Bits shall be 40 and 10 per cent. Douglas Mfg. Co., Russell & Erwin Mfg. Co., sole agents; W. A. Ives & Co., Elmira Noble Mfg. Co., Connecticut Valley Mfg. Co., C. L. Griswold, Snell Mfg. Co., C. E. Jennings & Co., French, Swift & Co., Humphreysville Mfg. Co.

Office of HORACE DURRIE & Co.,
97 Chambers Street,
New York, Oct. 7, 1879.

The list on Hollow Augers remains unchanged, but the discount on same is at present 30 per cent. Yours truly,

HORACE DURRIE & Co.,
Agents for FRENCH, SWIFT & Co.

HARTFORD, October 1, 1879.
Destroy all former discount sheets. We quote:

	per cent.
Boxwood Rules.....	550
Ivory ".....	500
No. 1 Square and Bevels.....	300
No. 2 ".....	450

WILLIS THRALL & SON.

[illegible]



ENTERPRISE MFG. CO., of Pa.,
PATENTED HARDWARE MANUFACTURERS, AND IRON FOUNDERS,
THIRD and DAUPHIN Sts., PHILADELPHIA.

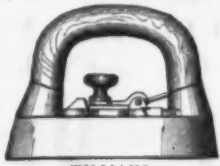


CAUTION
TO
Makers, Sellers & Users of Sad-Irons.
RE-ISSUE OF Mrs. POTTS' PATENT.

HOWSONS' PATENT and LAW OFFICES,
 119 South Fourth St. Philadelphia.
 Messrs. THE ENTERPRISE MANUFACTURING CO. & AMERICAN MACHINE CO.

Gentlemen:—Compliance with your request for our opinion (for publication) relating to the sad-irons made by Williams & Son, of Chagrin Falls, Ohio, and by the Gold Sad-Iron Company, of Lockport, N. Y., has been delayed until we had completed our researches in the Patent Office, and until the grant of the Re-issue of Mrs. Potts' patent.

It is just as certain in our minds that both of these irons infringe your re-issued patent, as that they are imitations of the Mrs. Potts sad-iron.

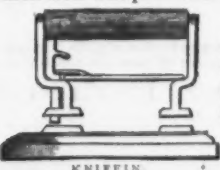


We have before us a specimen of the Williams iron, and a copy of his patent, dated May 27th, 1879, the annexed cut being an exact copy on a reduced scale of one of the views in his patent.

The application for this patent was filed with seven claims, the first of which was for "a sad-iron in combination with a detachably attached epicycloidal or semi-ellipsoidally shaped handle." All the claims were rejected, in view of several prior patents, including that of Mrs. Potts, and the applicant abandoned them all, and contented himself with a single claim relating to a special combination of parts with which the handle had no special connection. This may be looked upon as an admission on the part of the patentee that Mrs. Potts' patent was a bar to a claim for the handle.

Both infringers have imitated the arched handle, the base, and other prominent features of the Potts' sad-iron, but the Gold Sad-iron Company have gone further, and imitated the cuts of your circulars.

The circulars of the Gold Company state that their iron was patented April 23d, 1867. (Lewis.)



We reproduce on a reduced scale one of the views in the drawing of this patent, which you will recognize as much more like the prior patent of Kniffin, recently purchased by your firm, than it is like the imitation sad-iron made by the Gold Co.

The list of claims in the recently re-issued patent of Mrs. Potts, which was granted after the most thorough investigation, will afford better proof of the character of the infringement than any thing we can say, hence we send you a copy of these claims with a copy of one of the principal views in the drawings attached to the patent.

We think that any one, on examining these claims, will recognize many features contained in the Williams and Gold sad irons, and will agree with us that those irons are point blank infringements of your patents.

Respectfully yours,

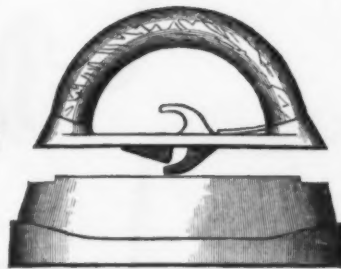
HOWSON & SON.

CLAIMS

OF THE
 Re-issued Patent of Mrs. Potts,

(Oct. 7, 1879. 8,025.)

Original Patent dated April 4, 1871.



First.—The combination of the wooden handle A, the top and legs of which form a continuous arch, rounded transversely, with the metal connecting plate B secured directly to the basis of the arch, and latching mechanism carried solely by the plate, all substantially as set forth.

Second.—The combination of the arched handle A of wood with a metal plate B, having inclined abutments or bearings for the said handle, substantially as specified.

Third.—The combination of the handle, the plate B, having inclined abutments recessed on the under side, and the screws a a.

Fourth.—The combination in a sad-iron of a base having in the top a recess and a cross-piece or bar therein, with a detachable handle carrying a fixed and movable jaw for seizing the said cross-piece or bar, all substantially as described.

Fifth.—The combination of the wooden handle and its plate B carrying a fixed jaw and a movable jaw with a base constructed for being locked to and released from the said jaws, all substantially as described.

Sixth.—The combination of the handle and its plate B, the hooked jaw D and pivoted lever C and its jaw with the base having a recess for receiving the jaw and cross-piece or bar adapted to the same, substantially as set forth.

Seventh.—The combination of the handle, its plate B and pivoted lever C with the spring f confined between the handle and its abutment on the plate, as set forth.

Eighth.—The combination of the handle and its plate B, with the lever C, pivoted so as to be moved vertically and having a projection j occupying a central position in respect to the handle, all substantially as set forth.

Ninth.—The combination of the arched handle A, made alike at both ends and carrying centrally situated jaws with the base E pointed at both ends alike and having a central cross-piece or bar adapted to the jaws, all substantially as set forth.



Send for Illustrated Catalogue and Price List.



The Iron Age Directory

and Index to Advertisements.

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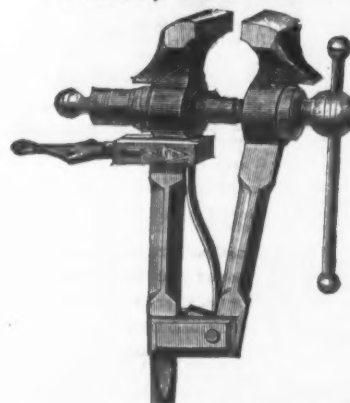
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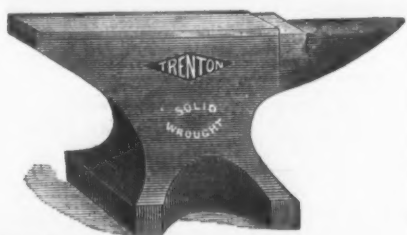
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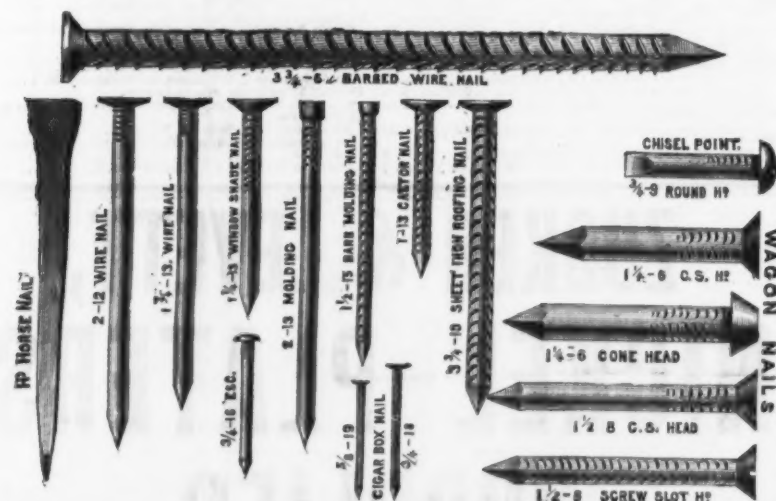
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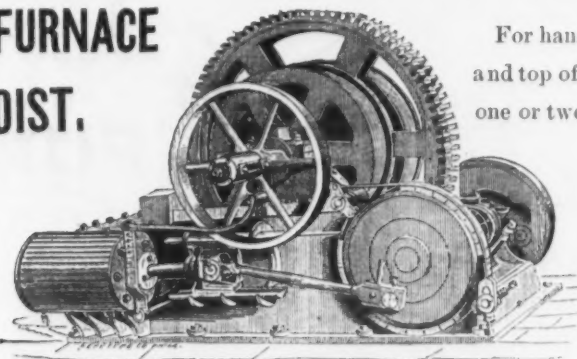
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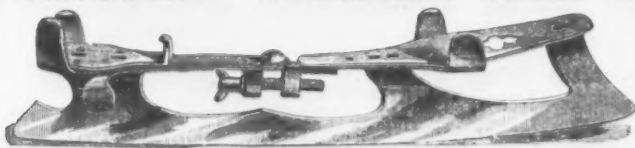
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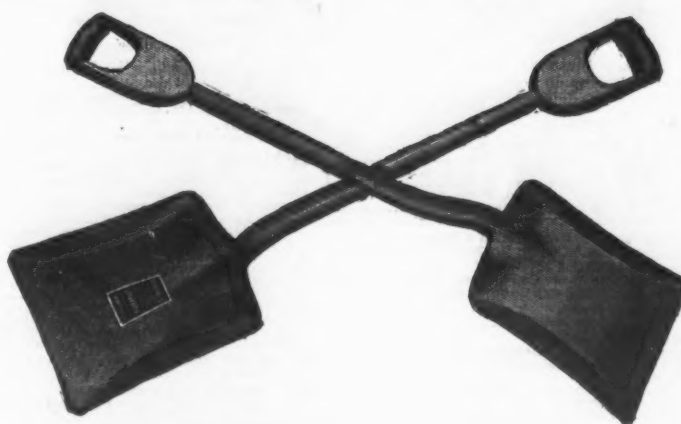
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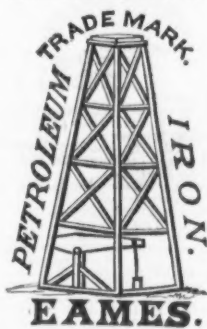
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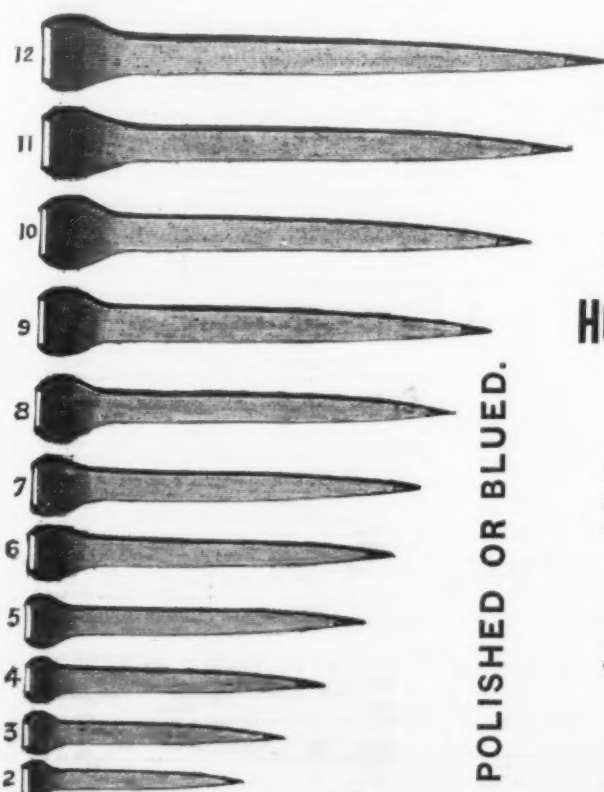
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Machine and Plow Bolts,
FORGED SET SCREWS,
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PATENT COMBINATION WRENCH.

These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, case-hardened throughout, and not only combine all of the superior qualities of our Cylinder or Gas Pipe Wrenches, but also all requisite Combinations of a regular Nut Wrench, thus making a combination which has no equal.

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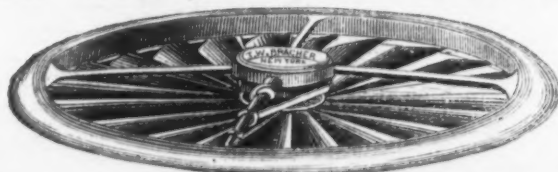
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For everything (and every size), from a hat or cap to an exhibition building.

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Protective Ventilators avoid drafts, exclude dust, dampness, malaria and germs of disease; adopted by hospitals, schools, institutions, &c.; applied to any window or room.

Prof. A. L. Loomis, M. D., University of City of New York, writes as follows:

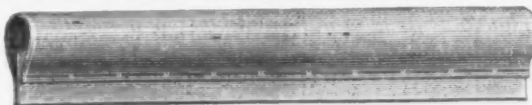
"From my personal experience and that of my patients who have used your Ventilator during the past six months, I am convinced that your method of removing dust, impurities and dampness from the atmosphere is the best which has as yet been proposed. By it the air in an apartment can be constantly changed without causing drafts. I would especially recommend its adoption in sick rooms, sleeping apartments, nurseries and school rooms."

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Put up in Coils of 50 feet. It is cheap, durable and portable.



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IRON.—DUET, 18 to 19 gals. $\frac{1}{2}$ lb. Sheet, Hand
Cast and Scrap, 15 to 16 g. $\frac{1}{2}$ lb. provided that none
of the above is over 12 in. wide and 12 ft. long. 10 to 15
per cent. Pig, $\frac{1}{2}$ lb. 7 to 8 ton; Polished Sheet, 30, 50, 70
lb. Wrought Scrap, 10 to 12 ton; Cast Scrap, 30, 50, 70 lb.
10 to 20, 30, 50, 70, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000, 1050, 1100, 1150, 1200, 1250, 1300, 1350, 1400, 1450, 1500, 1550, 1600, 1650, 1700, 1750, 1800, 1850, 1900, 1950, 2000, 2050, 2100, 2150, 2200, 2250, 2300, 2350, 2400, 2450, 2500, 2550, 2600, 2650, 2700, 2750, 2800, 2850, 2900, 2950, 3000, 3050, 3100, 3150, 3200, 3250, 3300, 3350, 3400, 3450, 3500, 3550, 3600, 3650, 3700, 3750, 3800, 3850, 3900, 3950, 4000, 4050, 4100, 4150, 4200, 4250, 4300, 4350, 4400, 4450, 4500, 4550, 4600, 4650, 4700, 4750, 4800, 4850, 4900, 4950, 5000, 5050, 5100, 5150, 5200, 5250, 5300, 5350, 5400, 5450, 5500, 5550, 5600, 5650, 5700, 5750, 5800, 5850, 5900, 5950, 6000, 6050, 6100, 6150, 6200, 6250, 6300, 6350, 6400, 6450, 6500, 6550, 6600, 6650, 6700, 6750, 6800, 6850, 6900, 6950, 7000, 7050, 7100, 7150, 7200, 7250, 7300, 7350, 7400, 7450, 7500, 7550, 7600, 7650, 7700, 7750, 7800, 7850, 7900, 7950, 8000, 8050, 8100, 8150, 8200, 8250, 8300, 8350, 8400, 8450, 8500, 8550, 8600, 8650, 8700, 8750, 8800, 8850, 8900, 8950, 9000, 9050, 9100, 9150, 9200, 9250, 9300, 9350, 9400, 9450, 9500, 9550, 9600, 9650, 9700, 9750, 9800, 9850, 9900, 9950, 10000, 10050, 10100, 10150, 10200, 10250, 10300, 10350, 10400, 10450, 10500, 10550, 10600, 10650, 10700, 10750, 10800, 10850, 10900, 10950, 11000, 11050, 11100, 11150, 11200, 11250, 11300, 11350, 11400, 11450, 11500, 11550, 11600, 11650, 11700, 11750, 11800, 11850, 11900, 11950, 12000, 12050, 12100, 12150, 12200, 12250, 12300, 12350, 12400, 12450, 12500, 12550, 12600, 12650, 12700, 12750, 12800, 12850, 12900, 12950, 13000, 13050, 13100, 13150, 13200, 13250, 13300, 13350, 13400, 13450, 13500, 13550, 13600, 13650, 13700, 13750, 13800, 13850, 13900, 13950, 14000, 14050, 14100, 14150, 14200, 14250, 14300, 14350, 14400, 14450, 14500, 14550, 14600, 14650, 14700, 14750, 14800, 14850, 14900, 14950, 15000, 15050, 15100, 15150, 15200, 15250, 15300, 15350, 15400, 15450, 15500, 15550, 15600, 15650, 15700, 15750, 15800, 15850, 15900, 15950, 16000, 16050, 16100, 16150, 16200, 16250, 16300, 16350, 16400, 16450, 16500, 16550, 16600, 16650, 16700, 16750, 16800, 16850, 16900, 16950, 17000, 17050, 17100, 17150, 17200, 17250, 17300, 17350, 17400, 17450, 17500, 17550, 17600, 17650, 17700, 17750, 17800, 17850, 17900, 17950, 18000, 18050, 18100, 18150, 18200, 18250, 18300, 18350, 18400, 18450, 18500, 18550, 18600, 18650, 18700, 18750, 18800, 18850, 18900, 18950, 19000, 19050, 19100, 19150, 19200, 19250, 19300, 19350, 19400, 19450, 19500, 19550, 19600, 19650, 19700, 19750, 19800, 19850, 19900, 19950, 20000, 20050, 20100, 20150, 20200, 20250, 20300, 20350, 20400, 20450, 20500, 20550, 20600, 20650, 20700, 20750, 20800, 20850, 20900, 20950, 21000, 21050, 21100, 21150, 21200, 21250, 21300, 21350, 21400, 21450, 21500, 21550, 21600, 21650, 21700, 21750, 21800, 21850, 21900, 21950, 22000, 22050, 22100, 22150, 22200, 22250, 22300, 22350, 22400, 22450, 22500, 22550, 22600, 22650, 22700, 22750, 22800, 22850, 22900, 22950, 23000, 23050, 23100, 23150, 23200, 23250, 23300, 23350, 23400, 23450, 23500, 23550, 23600, 23650, 23700, 23750, 23800, 23850, 23900, 23950, 24000, 24050, 24100, 24150, 24200, 24250, 24300, 24350, 24400, 24450, 24500, 24550, 24600, 24650, 24700, 24750, 24800, 24850, 24900, 24950, 25000, 25050, 25100, 25150, 25200, 25250, 25300, 25350, 25400, 25450, 25500, 25550, 25600, 25650, 25700, 25750, 25800, 25850, 25900, 25950, 26000, 26050, 26100, 26150, 26200, 26250, 26300, 26350, 26400, 26450, 26500, 26550, 26600, 26650, 26700, 26750, 26800, 26850, 26900, 26950, 27000, 27050, 27100, 27150, 27200, 27250, 27300, 27350, 27400, 27450, 27500, 27550, 27600, 27650, 27700, 27750, 27800, 27850, 27900, 27950, 28000, 28050, 28100, 28150, 28200, 28250, 28300, 28350, 28400, 28450, 28500, 28550, 28600, 28650, 28700, 28750, 28800, 28850, 28900, 28950, 29000, 29050, 29100, 29150, 29200, 29250, 29300, 29350, 29400, 29450, 295

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Chinese dry	8
Ultramarine	15 60
Brown, Spanish	14
Van Dyke	10 12
Carmine combination price	
" "	.....	14 15
" "	in oil.....	4 10 15 20
Paris	..... good, 25c; best, 50c	
Iron Paint, Bright Red	.....	2 24
Red	.....	2 24
Brown	.....	2 24
Purple	.....	2 24
Ground in Oil, Bright Red	.....	2 24
" "	Red	2 24
" "	Brown	2 24
" "	Purple	2 24
Mineral Paints	.....
Orange Mineral	.....	10
Red Lead	.....	55 14 50
Brown	.....	50
English	.....	50 color
Venetian (S. C.) dry	.....	8 65
" "	.....	10 12
Indian dry	.....	5 12
Rose Pink	.....	10 13
Sienna, American	.....	11 15 25
Burnt	.....	4 18
" "	in oil.....	11 15 20 25
Raw	.....	3 4 6 8 10
Burnt	.....	4 18
" "	in oil.....	9 12 15 18
Raw	.....	11 15 25
" "	in oil.....	10 15 18
Vermillion, Chinese	.....	10
English	.....	11 15
Trieste	.....	11 15
American, Common	.....	13
White Lead	.....	8 10
" "	in oil.....	7 14
White, Paris, English	..... in bulk 2 4	
Yellow Ochre, French	.....	2 4
" "	in oil.....	10 12 15 18
Vermont	..... in cask	2 4
Yellow Chrome	.....	14 18 25
" "	in oil.....	14 18 25
Pine White, American S. I. dry	.....	12
" "	in oil.....	10 12 15 18
French (Paris)	.....	10 12 15 18
" "	in oil.....	10 12 15 18
Oils.	.....
Linseed, Raw, in casks and tubs.....	7 gal. 50c 6 gal. 45c	
Bull.	.....	50c
Boiled	.....	50c
" "	.....	50c
Sperm	.....	7 gal. 50c 6 gal. 45c
Klephant	.....	50c
Signal	.....	50c
Prime Lard	.....	47
West Virginia	.....	47
Drilling	.....	120
Empire Cylinder	.....	38
Miners Oil	.....	10 to 38
Fish oil, pressed	.....	33
Yellow Soot	.....	33
Yellow	.....	60
Machinery	60
Machine	60

Combination Punch and Shears.
Cuts Round and Flat Iron.

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Punch $\frac{3}{4}$ to 1 inch

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For Workers in Iron and Steel
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in. $\frac{1}{2}$ in. Plates.

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Steel, adapted to all trades.

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Pig Metal.....	80,000 "
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Total Capacity per year.....	250,000 "

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PYROLUSITE MANGANESE COMPANY,

MINERS, DEALERS AND EXPORTERS OF HIGH TEST

Crystallized Black Oxide of

Manganese

IN CRUDE STATE.

Suitable for the manufacture of Ferro-Manganese, Spiegeleisen, Bessemer Pig, &c. Also, fine ground and granulated, especially prepared for

STEEL, GLASS, PAINT, VARNISH AND DRYER MAKERS, OIL BOILERS, &c.

MANUFACTURERS OF SUPERFINE FLOATED

Standard Barytes, Gritless Ochre, Borate of Manganese, &c.

Office, 54 Cliff Street, New York.

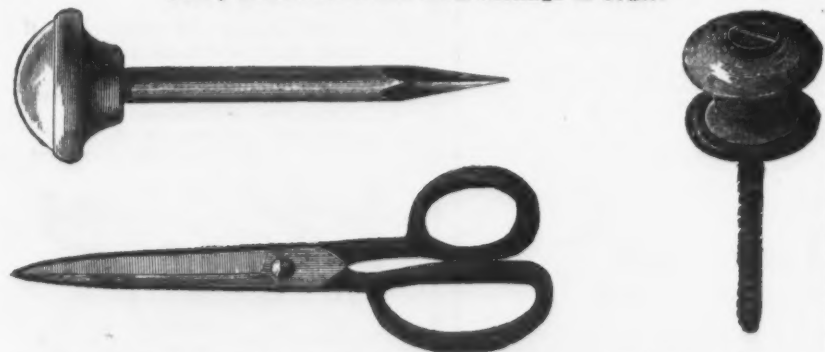
THE TURNER & SEYMOUR MFG. CO.,

MANUFACTURERS OF

Upholsterers', Stationers', House Furnishing and Fancy Hardware

AND NOTIONS.

Fancy Brass Goods and Iron Castings to Order.



Picture Nails, Knobs and Hooks, in great Variety. Gilt and Tinned Picture Wire, Twisted and Braided.

American Cast Shears,

Sold by Hardware and Notion Dealers everywhere.

Also Manufacturers of Shade Fixtures and Trimmings, Ink Stands, Twine Boxes, the Celebrated "Facilly" Egg Beater, Nutmeg Graters, Escutcheon Pins, Curtain Rings, &c., &c.

FACTORIES, Wolcottville, Conn.

Philadelphia Smelting Co.,

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GENUINE BABBITT,

Guaranteed at a speed of 10,000 a minute, and at any pressure for 10 years.

ALL GRADES OF ANTI-FRICTION METALS.

DEOXIDIZED BRONZE,

Superior to Phosphor Bronze or any other alloy of Copper and Tin for Machinery Journals.

Solders, Stereotype Metal, Gas and Steam Fittings and Fixtures, Brass and Composition Castings.

Send for circulars.

WIRE NAILS

French Points, Window Shade Nails,
Upholstering, **WAGON NAILS**, Molding Nails
(Sample Cards sent on application.)

Electrotype, Barbed Caster Nails,
Roofing Nails,

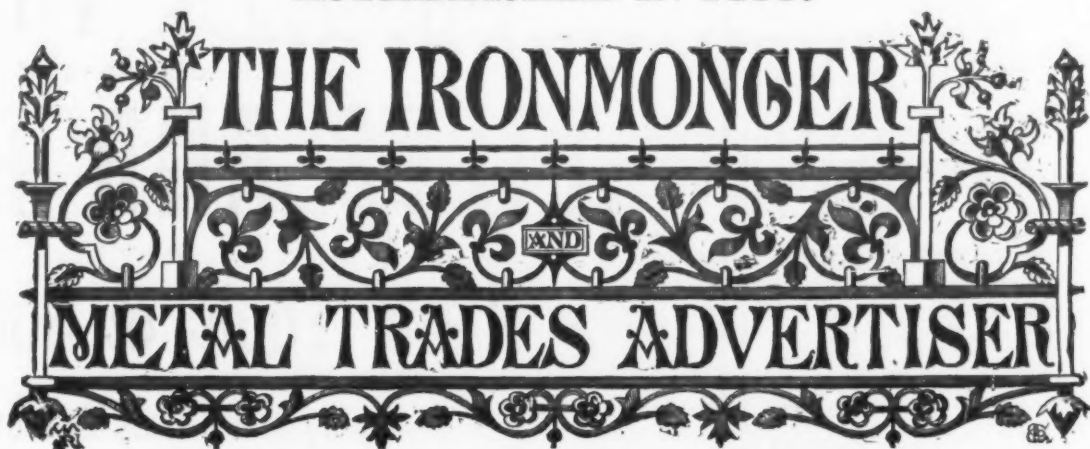
Veneer Nails, Label Tacks and small Nails of all kinds, Cabinet Nails, Barbed Lock Nails, Cigar Box Nails, &c., &c., put up in bulk, 5 lb. packages: 1 lb. papers, or as wanted.

AMERICAN WIRE NAIL CO.

Factory, Fifteenth and Madison Sts.

COVINGTON, KY.

ESTABLISHED IN 1859.



PUBLISHED EVERY SATURDAY.

THE OLDEST AND CHIEF REPRESENTATIVE OF THE IRON, HARDWARE AND METAL TRADES.

OFFICE: 44a CANNON STREET, LONDON, E. C.

ADVERTISEMENTS AND SUBSCRIPTIONS ARE RECEIVED AT THE VARIOUS OFFICES OF "THE IRON AGE," NAMELY

NEW YORK OFFICE: DAVID WILLIAMS, Publisher of *The Iron Age*, 83 Reade street.

PITTSBURGH OFFICE: 77 Fourth Avenue—JOS. D. WEEKS, Manager and Associate Editor.
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SPECIAL FEATURES.

Notes of Novelties.—This is a department of the journal always watched with interest by the trade, as it contains an account, from week to week, of the novelties which manufacturers and inventors are introducing to the notice of the trade. These articles are freely illustrated.

Special Correspondents.—The *Ironmonger* has a deserved reputation for its special correspondence from all the principal Continental, British and manufacturing centers. The writers are gentlemen holding important positions in the districts with which they are connected, and possess facilities for acquiring information specially suited for the columns of the *Ironmonger*. *The Week*, *Legal News*, *Trade Notes*, *Bankruptcies*, *Foreign Notes*, *Colonial Jottings*, *Merchants' Circulars*, *Imports and Exports*, &c., are each departments of the journal, containing a digest of all matters of direct interest to the Iron, Hardware and Metal Trades. In addition to the above, there is a carefully classified list of Patents, together with Editorial Notes, French, Belgian and other Special Correspondence.

SUBSCRIPTIONS

to the *Ironmonger and Metal Trades Advertiser*, with which is sent every fourth week the Foreign Supplement (see below), may commence from any date, but are not received for less than a year complete. The rate is \$5 per annum, inclusive of postage to any part of the world outside Great Britain. To every subscriber is presented, free, in the course of his year, a handsome and useful *Ironmongers' Diary and Text Book*, a work sold to non-subscribers at 75 cents.

ADVERTISEMENTS

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SPECIAL ISSUES.

In April and October of each year there is published a Special Issue, the circulation of which is not less than Twelve Thousand (12,000) copies.

THE IRONMONGERS' DIARY AND TEXT BOOK.

This is an annual, presented free to every Subscriber to the *IRONMONGER AND METAL TRADES' ADVERTISER*. It contains a large number of ruled skeleton pages for diary and other entries, and in addition much useful reference information, varied from year to year. It is handsomely bound in cloth, gilt; and as copies are used in thousands of establishments for a whole year, it is obviously a medium of exceptional value for advertisements. Sold to non-subscribers at 75 cents.

THE FOREIGN SUPPLEMENT

Is published every fourth week in connection with the extensive and world-wide circulation of the *Ironmonger* itself. The dates of its publication in 1879 will be as follows:

JANUARY 11, FEBRUARY 8, MARCH 8, APRIL 5, MAY 3 and 31, JUNE 28, JULY 26, AUGUST 23, SEPTEMBER 20, OCTOBER 18, NOVEMBER 15, DECEMBER 13.

This Supplement is published in

FIVE LEADING COMMERCIAL LANGUAGES

of the world, including English, and is sent to all the countries where they are spoken, thus placing the contents of the *Ironmonger* not only within reach of the native language of eighty millions of German, forty-two millions of French, twenty-eight millions of Italian, and fifty-one millions of Spanish speaking people; or, in all, over two hundred millions of inhabitants in the principal nations where the best purchasers of manufactured goods are to be found.

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Advertisers will do well to use Illustrations freely. Where economy of space is an object, a left page illustrated and described, in one language, can be suitably described in four or more languages on the opposite or right page without illustrating.

THE WHOLE FOREIGN HARDWARE TRADE,

so far as our experience of twenty years is concerned, will be covered by THE FOREIGN SUPPLEMENT at least twice a year. Thus a Price List or Advertisement inserted in the *Ironmonger* and FOREIGN SUPPLEMENT is a strikingly powerful and most efficient way of publicity, not to be compared with any of the other ordinary channels of communication.

B. KREISCHER & SONS, FIRE BRICK.

BEST AND CHEAPEST.
Established 1845.
Office, foot of Houston Street, East River,
NEW YORK.

NEWTON & CO.,

Successor to
PALMER, NEWTON & CO.,
ALBANY, N. Y., Manufacturers of

FIRE BRICK

Stove Linings,
Range and Heater Linings
Cylinder Brick, &c., &c.

M. D. Valentine & Bro

Manufacturers of

FIRE BRICK
And Furnace Blocks
DRAIN PIPE & LAND TILE.

Woodbridge, - - - N. J.

PERTH AMBOY TERRA COTTA CO.,

Successors to

A. HALL & SONS, Perth Amboy, N. J.,
ARCHITECTURAL TERRA COTTA

FIRE BRICK.
170 Broadway, NEW YORK.

Brooklyn Clay Retort

FIRE BRICK WORKS.

Manufacturers of Clay Retorts, Fire Bricks, Ga
House and other Tile, Cupola Brick, &c. Dealers in
and Miners of Fire Clay and Fire Sand. Clay bank at
Burr's Creek, New Jersey. Manufacture Van Dyke,
Elizabeth, Richards and Partition Sts., Brooklyn, N. Y.
Office No. 88 Van Dyke St.

Watson Fire Brick Manufactory

ESTABLISHED 1804.

JOHN R. WATSON, Perth Amboy, New Jersey,
Manufacturer of

FIRE BRICK,

For Rolling Mills, Blast Furnaces, Foundries,
Gas Works, Lime Kilns, Tanneries, Boiler
and Grate Setting, Glass Works, &c.
FIRE CLAYS, FIRE SAND, AND KAOLIN FOR SALE.

HENRY MAURER,

Proprietor of the

Excelsior Fire Brick & Clay Retort Works,

Manufacturer of FIRE BRICK, HOLLOW
BRICK AND CLAY RETORTS.
WORKS PERTH AMBOY, NEW JERSEY
Office & Depot: 418 to 422 East 23d St., N. Y.

TROY FIRE BRICK WORKS

Troy, N. Y.,

JAMES OSTRANDER & SON,

ESTABLISHED 1848,
Manufacturers of

FIRE BRICK,

Tuyeres, Tiles, Blast Furnace Blocks, &c. Miners and
Dealers in Woodbridge Fire Clay and Sand, and Staten
Island Kaolin.

Established 1864.

CARDNER BROTHERS,

MANUFACTURERS OF

STANDARD SAVAGE
Fire Brick, Tile & Furnace Blocks,
OF ALL SHAPES AND SIZES.

Clay Gas Retorts and Retort Settings,
AND

Miners and Shippers of Fire Clay.

OFFICE: 376 Penn Ave., Pittsburgh, Pa.
WORKS: Mt. Savage Junction, Md., and Lockport, Pa.

BORGNER & O'BRIEN,

Manufacturers of

Fire Bricks,
Clay Gas Retorts,
Retort Settings,
Tiles, Blocks, &c., &c.

23d St., below Vine,
PHILADELPHIA.

Eighteen years' practical experience.

CYRUS BORGNER. WM. J. O'BRIEN

MILLER'S BRICK PRESSES

(Established 1844).

FIRE and RED BRICK,

And Brickmakers' Tools in General.

SAML. P. MILLER & SON,
309 South 5th St., Philadelphia.

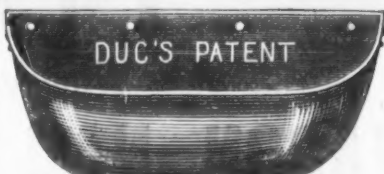
W. & J. TIEBOUT,

Manufacturers of

Brass, Galvanized & Ship
Chandlery Hardware,
No. 290 Pearl Street, New York.

"DRAW CUT"
BUTCHERS' MACHINES.
Choppers, Hand and Power
Stuffers,
Lard Presses.
Warranted thoroughly made
and the BEST IN USE.
MURRAY IRON WORKS,
Hartington, Iowa.

DUK'S IMPROVED ELEVATOR BUCKET.



THE STORE-HOUSE BUCKET.
(Partial straight front.)
In 12 in., 14 in., 16 in. and 17 in. Sizes.

Send for Circular.

Made of Best Charcoal Stamping Iron.
No Corners to Catch.
Light Running and Very Durable.
The only Scientifically Constructed Elevator Bucket
in the Market.

T. F. ROWLAND,

Sole Manufacturer,

CONTINENTAL WORKS, Brooklyn, E. D., N. Y.



THE
MILL BUCKET.
In 3 1/2 in. to 10 in.
Sizes.

NICHOLSON FILE CO., FILES AND RASPS.

Manufacturers of

Filers' Tools & Specialties.

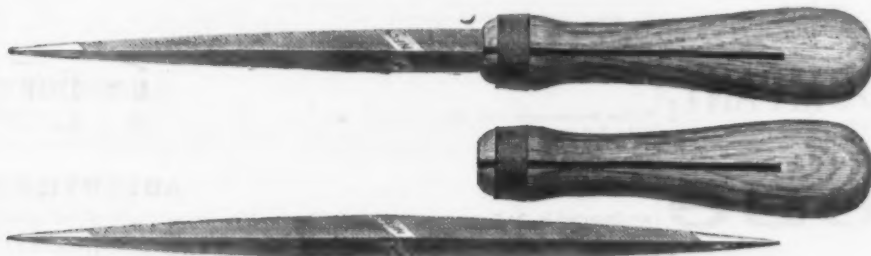
Manufactory and Offices at Providence, R. I.

The following space will be used in illustrating our specialties, the matter being changed weekly.

(Trade Mark.)

"DOUBLE ENDER" HAND-SAW FILE AND HANDLE.

Patented January 1st, 1878.



The above illustrations represent a new pattern of Handsaw File
and handle; also the two combined as when ready for use.

We have for a long time felt that a file so universally used as the
Handsaw File, could be presented to the public in a form that would
more perfectly adapt it to their wants, and that, at the same time, it
should be accompanied with a cheap and convenient form of handle,
which could be instantly affixed.

Our Double Enders meet both these ideas, and cannot, we think,
fail to commend themselves to all classes in the community who will
give them a trial.

They are neatly put up in boxes containing six Double Enders
and six Handles, and designated as follows:

No. 7, Double Ender, single cut—represents two 3 1/2 in. Taper Saw Files.
No. 8, " " " " " " " 4 " " "
No. 9, " " " " " " " 4 1/2 " " "
No. 10, " " " " " " " 5 " " "

Every parcel will be labeled and every handle stamped with the words
"Double Ender," which we have secured as our Trade Mark, and by
which this class of goods will be known.

Its genuine merit, as a simple and useful combination, is as appar-
ent as its economy, and combined, they render it so desirable an article
for the consumer as to at once command the favorable attention of the
dealer.

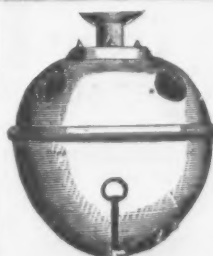
G. W. Bradley's Edge Tools.

Butchers' Cleavers,
Butchers' Choppers,
Axes and Hatchets,
Grub Hoes and Mattocks,
Mill Picks,
Box Chisels and Scrapers,

Ring Bush Hooks,
Ax Eye Bush Hooks,
Socket Bush Hooks,
Watt's Ship Carpenters' Tools,
Carpenters' Drawing Knives,
Coopers' and Turpentine Tools.

FOR SALE BY

MARTIN DOSCHER, Agent, 96 Chambers Street, N. Y.



Established 1838.
Bevin Bros. Mfg.
Co.,
Easthampton, Ct.
Manufacturers of
SLEIGH BELLS.
House, Tea, Hand,
Gong Bell &c.
Bell Metal Kettles.

John T. Lewis & Bros
No. 231 South Front St.,
PHILADELPHIA.



TRADE MARK.

MANUFACTURERS OF

Pure White Lead, Red Lead, Litharge,
Orange Mineral, Linseed Oil,
AND PAINTERS' COLORS

Brooklyn White Lead Co.



TRADE MARK.

White Lead, Red Lead & Litharge.
59 Mulden Lane, NEW YORK.
FISHER HOWE, TREASURER.

JOHN JEWETT & SONS

Manufacturers of the well-known brand of
WHITE LEAD.



TRADE MARK.

ALSO MANUFACTURERS OF

LINSEED OIL.

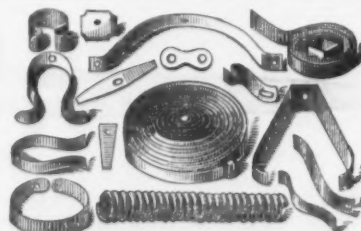
182 Front Street, NEW YORK.



TRADE MARK.

The Atlantic White Lead
and Linseed Oil Co.,

MANUFACTURERS OF
White Lead (Atlantic), Red Lead,
Litharge & Linseed Oil.
ROBERT COLGATE & CO.,
287 Pearl Street, New York



DUNBAR BROS.,

Manufacturers of

Clock Springs and Small Springs

of every description, from best Cast Steel,

BRISTOL, CONN.

Torrey's Door Springs.

P. R. DUNNE,

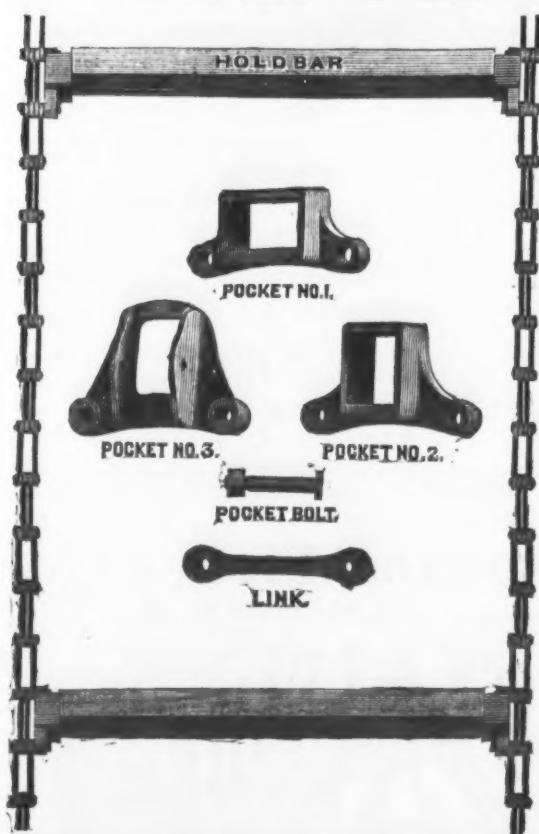
Manufacturer,



182 Fulton St.,
NEW YORK.

ORGANS

13 Stops, 3 set Reeds, Stool, Book,
only \$28. Pianos, Stool, Cover &
Book only \$14.75. Paper free.
D. F. BEATTY, Washington, N. J.

ICE CHAIN.

We are prepared to furnish promptly all kinds of

Flat Link Chains.

We have a book showing 100 different sizes of Links, which will be sent upon application.

Providence Tool Co.,
PROVIDENCE, R. I.

Boston Agency,
13 & 15 Pearl St.
J. H. WORK.

New York Agency,
11 Warren Street,
HENRY B. NEWHALL.

Chicago Agency,
163 & 165 Lake St.
S. H. & E. Y. MOORE.

IMPROVED PIPE-FITTERS' VISE.

STRONG,
LIGHT,
EFFICIENT,
CHEAP.

To meet the requirements of the large number of persons who have use for such an article, we invite attention to our Improved Pipe Vise. This Vise can be used either as a permanent fixture to work bench, attached to angle plate or can (unlike others) be held between the jaws of any Machinist's or Blacksmith's Vise; the movable jaw being OPEN ON SIDE permits work to be gripped at any desired point without slipping it in from end, and allows of FITTINGS BEING HELD SECURELY; the Box is made of Malleable Iron, the Screw of Wrought Iron, and the remainder of Solid Steel throughout. The Steel Gripping Jaws can be duplicated and replaced at any time when worn out. It is a very convenient tool, well adapted to the wants of Plumbers, Pump Fitters, Well-Drivers, and all who have use for a tool that is strong, light, efficient and cheap which can be readily carried about with kit of tools.

MANUFACTURED BY

PANCOAST & MAULE,
243 and 245 South Third Street, Philadelphia.

Wheeler, Madden & Clemson
MFG. CO.,
MIDDLETOWN, NEW YORK.

Manufacturers of

WARRANTED CAST STEEL

SAWS

Of every description, including

Circular, Shingle, Cross-Cut, Mill, Hand, WOOD SAWS, Etc., Etc.

AMERICAN SAW CO.,

Manufacturers of

Movable Toothed Circular Saws, PERFORATED CROSS-CUT SAWS
And **SOLID SAWS** of all kinds. **Trenton, N. J.**

HUNDLEY & HANKS,

PROPRIETORS OF

NORTH CAROLINA HANDLE CO.



Handles and Spokes,

79 Reade Street and 97 Chambers Street, NEW YORK.

HARDWARE COMMISSION MERCHANTS.



TURNED MACHINE SCREWS,

One-sixteenth to five-eighths diameter. Heads and points to sample.

IRON, STEEL and BRASS.

JOHN FELLOWS,

Successor to LYON & FELLOWS, Factory and Office, 14 Dunham Place, Williamsburgh, N. Y.



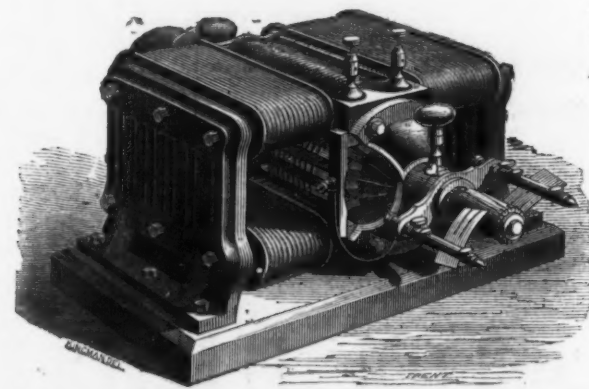
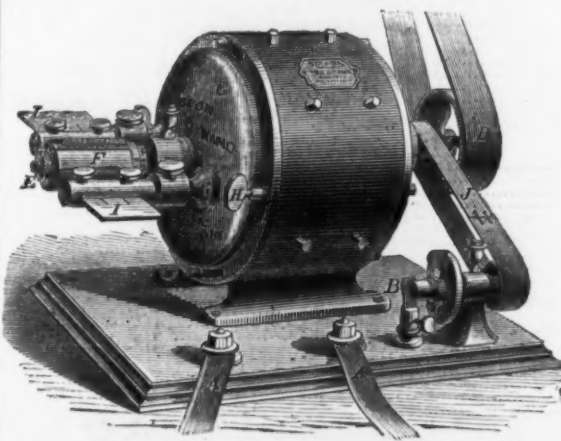
Manufacturers of GALVANIZED PUMP CHAIN FOR CHAIN PUMPS.

WESTON DYNAMO-ELECTRIC MACHINE CO.

286 Washington Street, Newark, N. J., U. S. A.,

MANUFACTURERS OF

Machines for Electric Light, Electrotyping and Electro-Plating.



ARE MAKING

THE MOST POWERFUL, SIMPLE AND COMPACT ELECTRIC LIGHT MACHINE IN THE WORLD.

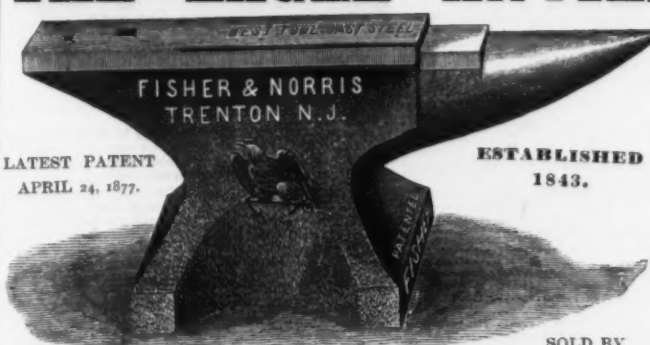
By actual tests this machine has been found to yield more than double the amount of light per horse-power obtained from the best machines built in this country.

Please send full particulars regarding buildings or localities to be lighted, available power, &c.

Centennial Gold Medal American Institute, 1876. Medal of Superiority, American Institute, 1877. Centennial Medal, Philadelphia, 1876. Paris Medal, 1878.

THE "EAGLE" ANVIL. WARRANTED!!

Better than the best English Anvil.



LATEST PATENT
APRIL 24, 1877.

ESTABLISHED
1843.

SOLD BY
New York—RUSSELL & ERWIN MANUFACTURING COMPANY, H. DURRIE & CO., TENNIS & WILSON.
Philadelphia—JAMES E. HAND & CO. Boston—GEORGE H. GRAY & DANFORTH.
Baltimore—W. H. COLE & SONS, JOHN R. KELSO, JR.
Louisville—W. B. BELKNAP & CO. Cincinnati—POST & CO. Cleveland—THE LAKE ERIE IRON CO.

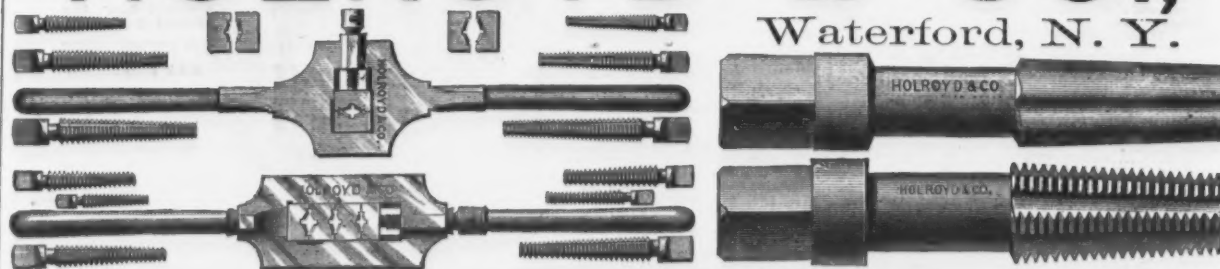
Face in one piece, of BEST TOOL CAST STEEL PERFECTLY WELDED, perfectly true; of hardest temper and never to come off or "settle." It does not bounce the hammer back, and therefore can do more work with lighter hammer. Horn of tough untempered steel, never to break or bend. Only Anvil made in United States fully warranted as above. None genuine without our trade-mark.

ANVILS weighing 100 lbs. to 800 lbs., 9 cents per lb., with special discounts to the trade.

SMALLER ANVILS ("MINIMS").

No.	00	0	1	2	3	4
Weighting about	5	10	15	20	30	40 lbs.
	\$1.75	2.25	2.75	3.25	4.00	4.50
No.	5	6	7	8	9	
Weighting about	50	60	70	80	90 lbs.	
	5.45	6.00	6.50	7.25	8.00	

HOLROYD & CO.,
Waterford, N. Y.



THE HOWE SCALE CO.,
Improved Scales & Weighing Machines of every Variety.

OFFICES:

PRIEST, PAGE & CO., 325 Broadway, New York. BORDEN, SELLECK & CO., 97 Lake Street, Chicago.
PRIEST, PAGE & CO., 145 Franklin Street, Boston. J. FRED. DENNIS, 16 Holborn Viaduct, London.

Works at Rutland, Vt.

BAEDER, ADAMSON & CO.,

Manufacturers of SAND & EMERY PAPER & EMERY CLOTH.

(Also in Rolls, for machine work.)

Ground Emery, Corundum & Flint, Glue & Curled Hair, Hair Felt, & Felt-
ing for Covering Boilers, Pipes, &c., Cow Hide Whips.
Stores: PHILADELPHIA, 730 Market St., BOSTON, 143 Milk St.,
NEW YORK, 67 Beekman St. CHICAGO, 132 Lake St.

VERMONT SNATH CO.,

Manufacturers of

Pat. Swing Socket Snaths

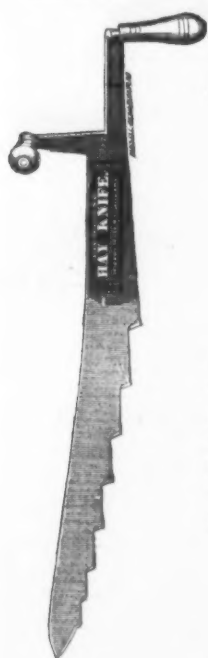
and also a large variety of other styles of Snaths
Springfield, Vermont.



PATENT

Expanding, Self-Draining
RUBBER BUCKET.

Manufactured only by
L. M. RUMSEY & CO.



LIGHTNING HAY KNIVES, WEYMOUTH'S PATENT.



This knife is the best in use for cutting down hay and straw in mow and stack, cutting fine feed from bale, cutting corn stalks for feed, cutting peat and ditching marches.

The blade is best cast steel, spring temper, easily sharpened, and is giving universal satisfaction. A few moments' trial will show its merits, and parties once using it are unwilling to do without it. Its sales are fast increasing for export as well as home trade, and it seems destined to take the place of all other Hay Knives.

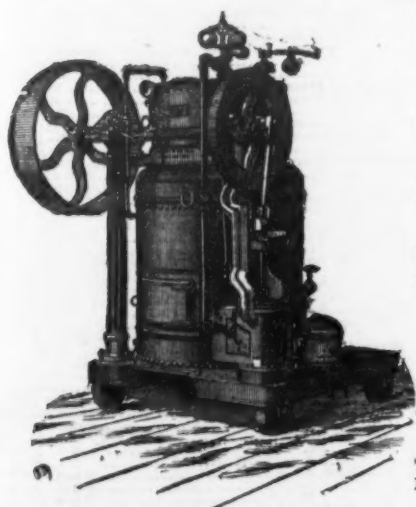
They are nicely packed in boxes, one dozen each, of 50 lbs. weight, suitable for shipping by land or water to any part of the world.

Manufactured only by

HIRAM HOLT & CO.,

East Wilton, Franklin Co., Maine.

For sale by the Hardware Trade generally.



SHAPLEY ENGINE.

Patented Feb. 10, 1874.
Released June 22, 1875.

Compact, Practical, Durable and Economical.

Acknowledged to be the best in use. This boiler stands unrivaled.

MANUFACTURED BY

SHAPLEY & WELLS,

Binghamton Iron Works,
Binghamton, N. Y.

MANUFACTURERS OF

Stationary Engines and Boilers.

Also Machinery for Mills of all kinds and Tanneries. Also their celebrated Bark Mills, acknowledged to be the best. Send for reduced price list circular.

JOHN ADT, BUILDER OF MANUFACTURERS' TOOLS, New Haven, Conn., U. S. A.

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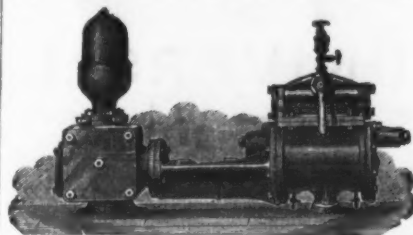
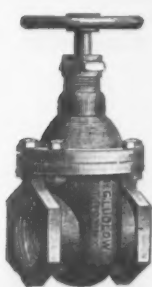
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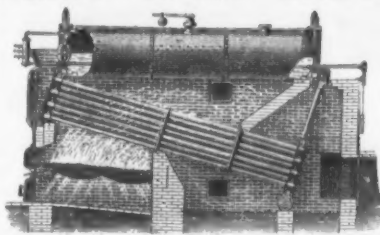
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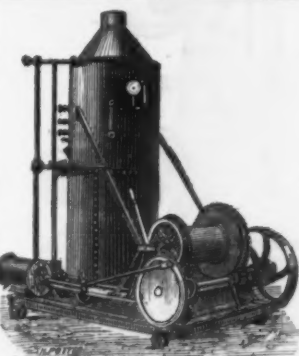
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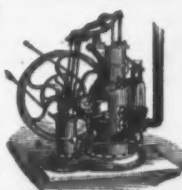


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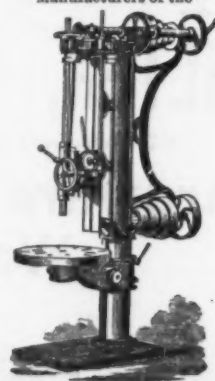
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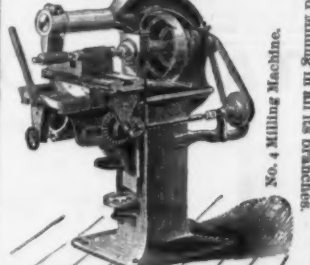


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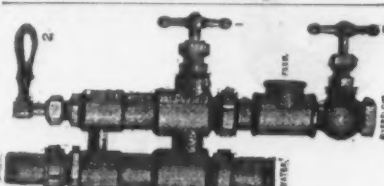
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For dimensions of Governor, see Illustrated Price List.



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Improved Steam Governor.

No Charge for Boxing or Cartage.

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Size, Inch.	Plain.	Bright Finish.	Extra Speed.	Stop Valve.
1 1/4	\$15.00	\$17.00	\$1.00
1 1/2	16.00	18.00	1.00
1 3/4	18.00	20.00	2.00	....
2	20.00	23.00	2.25	....
2 1/4	23.00	27.00	2.50	\$6.00
2 1/2	27.00	31.00	2.75	7.50
2 3/4	30.00	35.00	3.25	9.00
3	35.00	41.00	3.50	11.00
3 1/4	40.00	46.00	3.75	12.00
3 1/2	45.00	52.00	4.00	13.00
3 3/4	50.00	58.00	4.50	17.00
4	55.00	64.00	5.00	21.00
4 1/4	60.00	70.00	5.50	35.00
4 1/2	65.00	76.00	6.00	37.00
4 3/4	70.00	82.00	6.50	37.00
5	75.00	88.00	7.00	42.00
5 1/4	80.00	94.00	7.50	42.00
5 1/2	85.00	100.00	8.00	50.00
5 3/4	90.00	106.00	8.50	50.00
6	95.00	112.00	9.00	60.00
6 1/4	100.00	118.00	9.50	60.00
6 1/2	105.00	124.00	10.00	70.00
6 3/4	110.00	130.00	10.50	70.00
7	115.00	136.00	11.00	80.00
7 1/4	120.00	142.00	11.50	80.00
7 1/2	125.00	148.00	12.00	90.00
7 3/4	130.00	154.00	12.50	90.00
8	135.00	160.00	13.00	100.00
8 1/4	140.00	166.00	13.50	100.00
8 1/2	145.00	172.00	14.00	110.00
8 3/4	150.00	178.00	14.50	110.00
9	155.00	184.00	15.00	120.00
9 1/4	160.00	190.00	15.50	120.00
9 1/2	165.00	196.00	16.00	130.00
9 3/4	170.00	202.00	16.50	130.00
10	175.00	208.00	17.00	140.00
10 1/4	180.00	214.00	17.50	140.00
10 1/2	185.00	220.00	18.00	150.00
10 3/4	190.00	226.00	18.50	150.00
11	195.00	232.00	19.00	160.00
11 1/4	200.00	238.00	19.50	160.00
11 1/2	205.00	244.00	20.00	170.00
11 3/4	210.00	250.00	20.50	170.00
12	215.00	256.00	21.00	180.00
12 1/4	220.00	262.00	21.50	180.00
12 1/2	225.00	268.00	22.00	190.00
12 3/4	230.00	274.00	22.50	190.00
13	235.00	280.00	23.00	200.00
13 1/4	240.00	286.00	23.50	200.00
13 1/2	245.00	292.00	24.00	210.00
13 3/4	250.00	298.00	24.50	210.00
14	255.00	304.00	25.00	220.00
14 1/4	260.00	310.00	25.50	220.00
14 1/2	265.00	316.00	26.00	230.00
14 3/4	270.00	322.00	26.50	230.00
15	275.00	328.00	27.00	240.00
15 1/4	280.00	334.00	27.50	240.00
15 1/2	285.00	340.00	28.00	250.00
15 3/4	290.00	346.00	28.50	250.00
16	295.00	352.00	29.00	260.00
16 1/4	300.00	358.00	29.50	260.00
16 1/2	305.00	364.00	30.00	270.00
16 3/4	310.00	370.00	30.50	270.00
17	315.00	376.00	31.00	280.00
17 1/4	320.00	382.00	31.50	280.00
17 1/2	325.00	388.00	32.00	290.00
17 3/4	330.00	394.00	32.50	290.00
18	335.00	400.00	33.00	300.00
18 1/4	340.00	406.00	33.50	300.00
18 1/2	345.00	412.00	34.00	310.00
18 3/4	350.00	418.00	34.50	310.00
19	355.00	424.00	35.00	320.00
19 1/4	360.00	430.00	35.50	320.00
19 1/2	365.00	436.00	36.00	330.00
19 3/4	370.00	442.00	36.50	330.00
20	375.00	448.00	37.00	340.00
20 1/4	380.00	454.00	37.50	340.00
20 1/2	385.00	460.00	38.00	350.00
20 3/4	390.00	466.00	38.50	350.00
21	395.00	472.00	39.00	360.00
21 1/4	400.00	478.00	39.50	360.00
21 1/2	405.00	484.00	40.00	370.00
21 3/4	410.00	490.00	40.50	370.00
22	415.00	496.00	41.00	380.00
22 1/4	420.00	502.00	41.50	380.00
22 1/2	425.00	508.00	42.00	390.00
22 3/4	430.00	514.00	42.50	390.00
23	435.00	520.00	43.00	400.00
23 1/4	440.00	526.00	43.50	400.00
23 1/2	445.00	532.00	44.00	410.00
23 3/4	450.00	538.00	44.50	410.00
24	455.00	544.00	45.00	420.00
24 1/4	460.00	550.00	45.50	420.00
24 1/2	465.00	556.00	46.00	430.00
24 3/4	470.00	562.00	46.50	430.00
25	475.00	568.00	47.00	440.00
25 1/4	480.00	574.00	47.50	440.00
25 1/2	485.00	580.00	48.00	450.00
25 3/4	490.00	586.00	48.50	450.00
26	495.00	592.00	49.00	460.00
26 1/4	500.00	598.00	49.50	460.00
26 1/2	505.00	604.00	50.00	470.00
26 3/4	510.00	610.00	50.50	470.00
27	515.00	616.00	51.00	480.00
27 1/4	520.00	622.00	51.50	480.00
27 1/2	525.00	628.00	52.00	490.00
27 3/4	530.00	634.00	52.50	490.00
28	535.00	640.00	53.00	500.00
28 1/4	540.00	646.00	53.50	500.00
28 1/2	545.00	652.00	54.00	510.00
28 3/4	550.00	658.00	54.50	510.00
29	555.00	664.00	55.00	520.00
29 1/4	560.00	670.00	55.50	520.00
29 1/2	565.00	676.00	56.00	530.00
29 3/4	570.00	682.00	56.50	530.00
30	575.00	688.00	57.00	540.00
30 1/4	580.00	694.00	57.50	540.00
30 1/2	585.00	700.00	58.00	550.00
30 3/4	590.00	706.00	58.50	550.00
31	595.00	712.00	59.00	560.00
31 1/4	600.00	718.00	59.50	560.00
31 1/2	605.00	724.00	60.00	570.00
31 3/4	610.00	730.00	60.50	570.00
32	615.00	736.00	61.00	580.00
32 1/4	620.00	742.00	61.50	580.00
32 1/2	625.00	748.00	62.00	590.00
32 3/4	630.00	754.00	62.50	590.00
33	635.00	760.00	63.00	600.00
33 1/4	640.00	766.00	63.50	600.00
33 1/2	645.00	772.00	64.00	610.00
33 3/4	650.00	778.00	64.50	610.00
34	655.00	784.00	65.00	620.00
34 1/4	660.00	790.00	65.50	620.00
34 1/2	665.00	796.00	66.00	630.00
34 3/4	670.00	802.00	66.50	630.00
35	675.00	808.00	67.00	640.00
35 1/4	680.00	814.00	67.50	640.00
35 1/2	685.00	820.00	68.00	650.00
35 3/4	690.00	826.00	68.50	650.00
36	695.00	832.00	69.00	660.00
36 1/4	700.00	838.00	69.50	660.00
36 1/2	705.00	844.00	70.00	670.00
36 3/4	710.00	850.00	70.50	670.00
37	715.00	856.00	71.00	680.00
37 1/4	720.00	862.00	71.50	680.00
37 1/2	725.00	868.00	72.00	690.00
37 3/4	730.00	874.00	72.50	690.00
38	735.00	880.00	73.00	700.00
38 1/4	740.00	886.00	73.50	700.00
38 1/2	745.00	892.00	74.00	710.00
38 3/4	750.00	898.00	74.50	710.00
39	755.00	904.00	75.00	720.00
39 1/4	760.00	910.00	75.50	720.00
39 1/2	765.00	916.00	76.00	730.00
39 3/4	770.00	922.00	76.50	730.00
40	775.00	928.00	77.00	740.00
40 1/4	780.00	934.00	77.50	740.00
40 1/2	785.00	940.00	78.00	750.00
40 3/4	790.00	946.00	78.50	750.00
41	795.00	952.00	79.00	760.00
41 1/4	800.00	958.00	79.50	760.00
41 1/2	805.00	964.00	80.00	770.00
41 3/4	810.00	970.00	80.50	770.00
42	815.00	976.00	81.00	780.00
42 1/4	820.00	982.00	81.50	780.00
42 1/2	825.00	988.00	82.00	790.00
42 3/4	830.00	994.00	82.50	790.00
43	835.00	1000.00	83.00	800.00
43 1/4	840.00	1006.00	83.50	800.00
43 1/2	845.00	1012.00	84.00	810.00
43 3/4	850.00	1018.00	84.50	810.00
44	855.00	1024.00	85.00	820.00
44 1/4	860.00	1030.00	85.50	820.00
44 1/2	865.00	1036.00	86.00	830.00
44 3/4	870.00	1042.00	86.50	830.00
45	875.00	1048.00	87.00	840.00
45 1/4	880.00	1054.00	87.50	840.00
45 1/2	885.00	1060.00	88.00	850.00
45 3/4	890.00	1066.00	88.50	850.00
46	895.00	1072.00	89.00	860.00
46 1/4	900.00	1078.00	89.50	860.00
46 1/2	905.00	1084.00	90.00	870.00
46 3/4	910.00	1090.00	90.50	870.00
47	915.00	1096.00	91.00	880.00
47 1/4	920.00	1102.00	91.50	880.00
47 1/2	925.00	1108.00	92.00	890.00
47 3/4	930.00	1114.00	92.50	890.00
48	935.00	1120.00	93.00	900.00
48 1/4	940.00	1126.00	93.50	900.00
48 1/2	945.00	1132.00	94.00	910.00
48 3/4	950.00	1138.00	94.50	910.00
49	955.00	1144.00	95.00	920.00
49 1/4	960.00	1150.00	95.50	920.00
49 1/2	965.00	1156.00	96.00	930.00
49 3/4	970.00	1162.00	96.50	930.00
50	975.00	1168.00	97.00	940.00
50 1/4	980.00	1174.00	97.50	940.00
50 1/2	985.00	1180.00	98.00	950.00
50 3/4	990.00	1186.00	98.50	950.00
51	995.00	1192.00	99.00	960.00
51 1/4	1000.00	1198.00	99.50	960.00
51 1/2				

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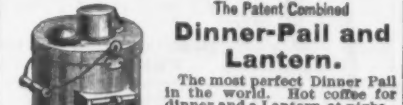
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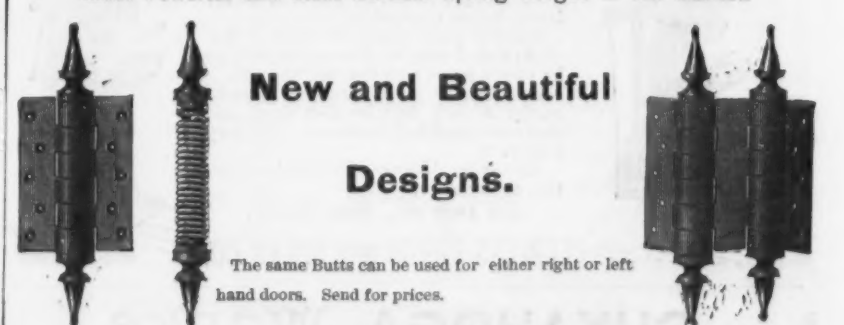
The Emperor Dom Pedro, accompanied by Director General Goshorn, Superintendent Albert, and others, visited Machinery Hall at the Centennial on the evening of June 28th. Among other things inspected, at the invitation of E. M. Boynton, of New York, they witnessed a trial of the New Lightning Saw, patented March 24, 1876. Two men, with one of these saws, cut off a sound log of gum-wood, one foot extreme diameter, in seven seconds, or at the rate of a cord of wood in five minutes. Messrs. Corlies, Morell, Lynch, and other members of the commission, witnessed the trial and timed the cutting. The Emperor remarked, "That was fast, very fast cutting." Last evening the Emperor made another examination of the saw. — Philadelphia Press, June 30.

"Boynton's" saws were effectually tested before the judges at the Philadelphia Fair, July 6th and 7th. An ash log, 11 inches in diameter, was sawed off, with a 4 1/2 foot lightning cross cut, by two men, in precisely 8 seconds, as timed by the chairman of the Centennial Judges of Class Fifteen. The speed is unprecedented, and would cut a cord of wood in 4 minutes. The representatives of Russia, Austria, France, Italy, Spain, Belgium, Sweden, England, and several other countries, were present, and expressed their high appreciation. Received Medal and Highest Award of Centennial World's Fair, 1876. \$1000 challenge was prominently displayed for six months, and the numerous saw manufacturers of the world dared not accept it, or test in a competition so hopeless.

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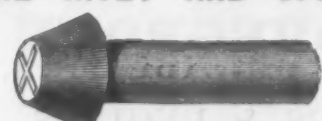
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